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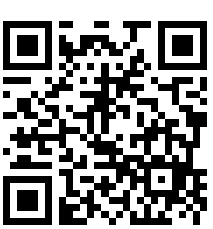

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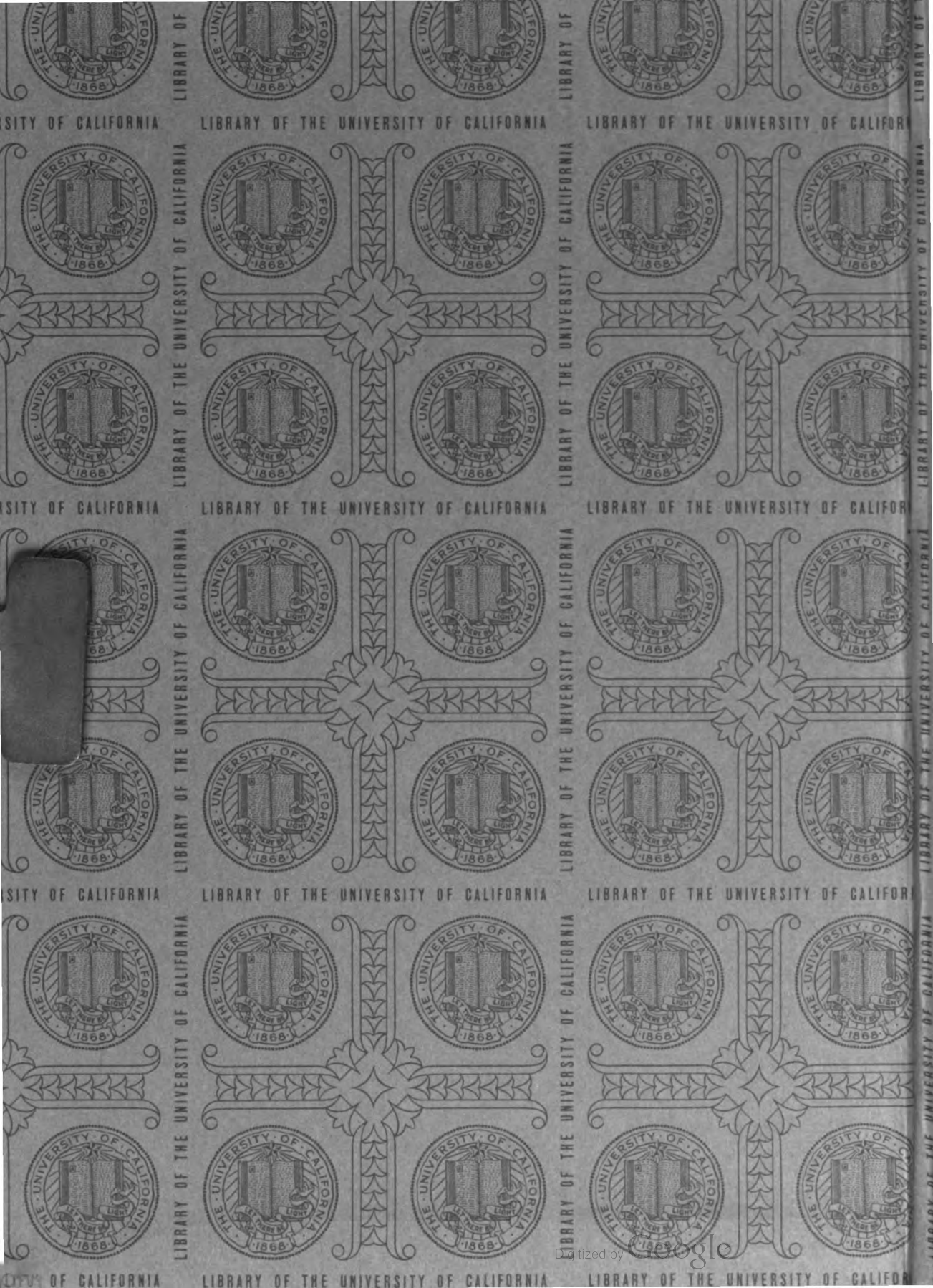

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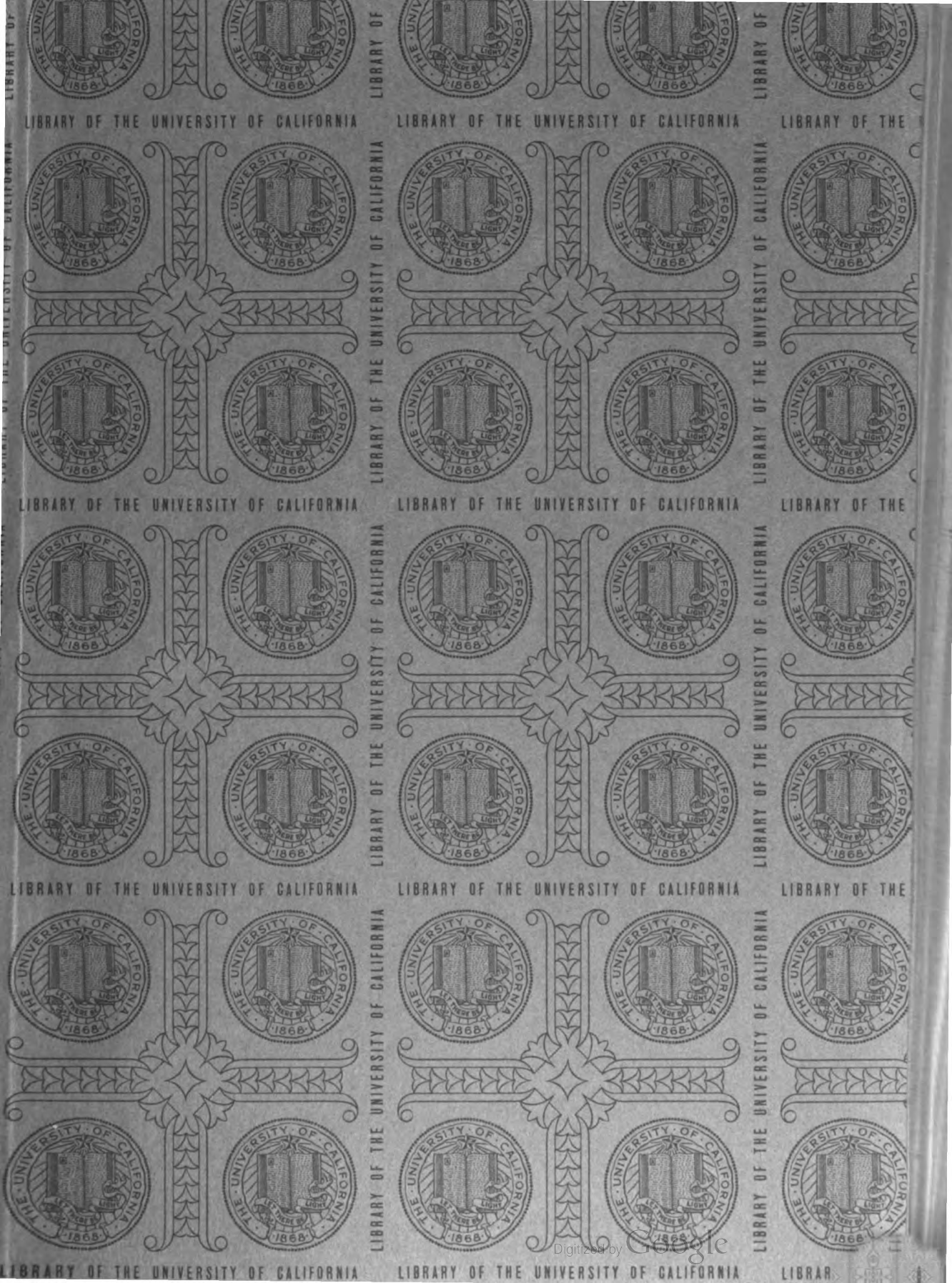

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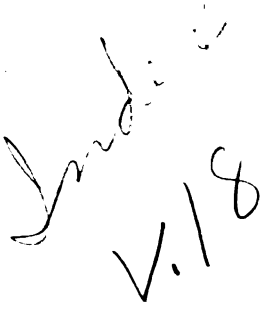

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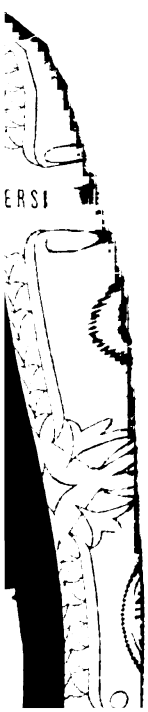

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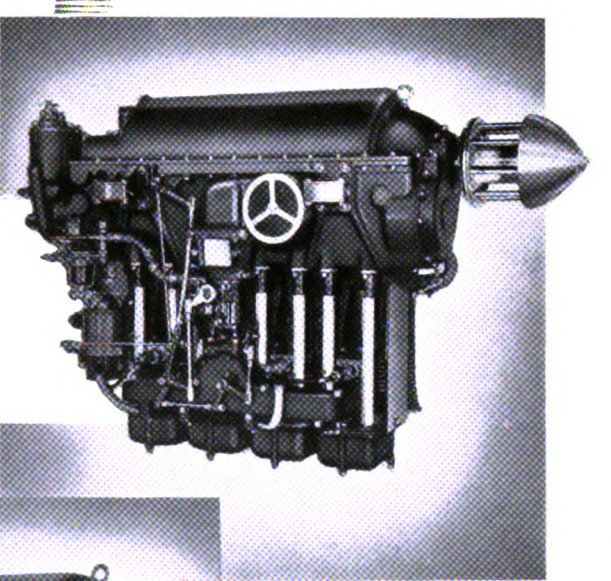

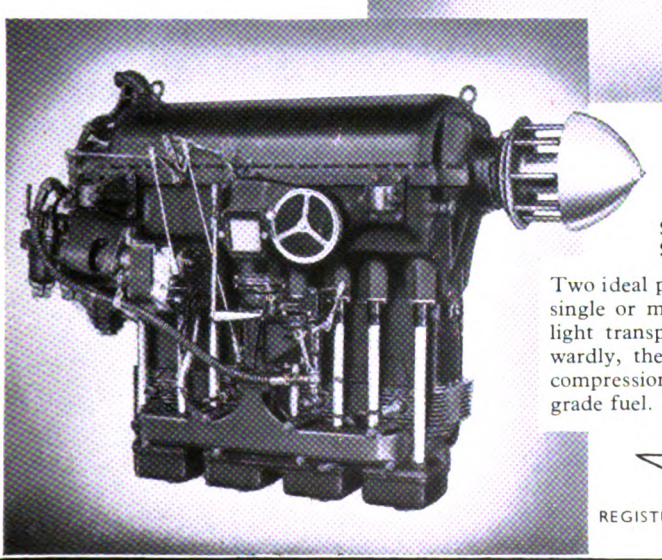

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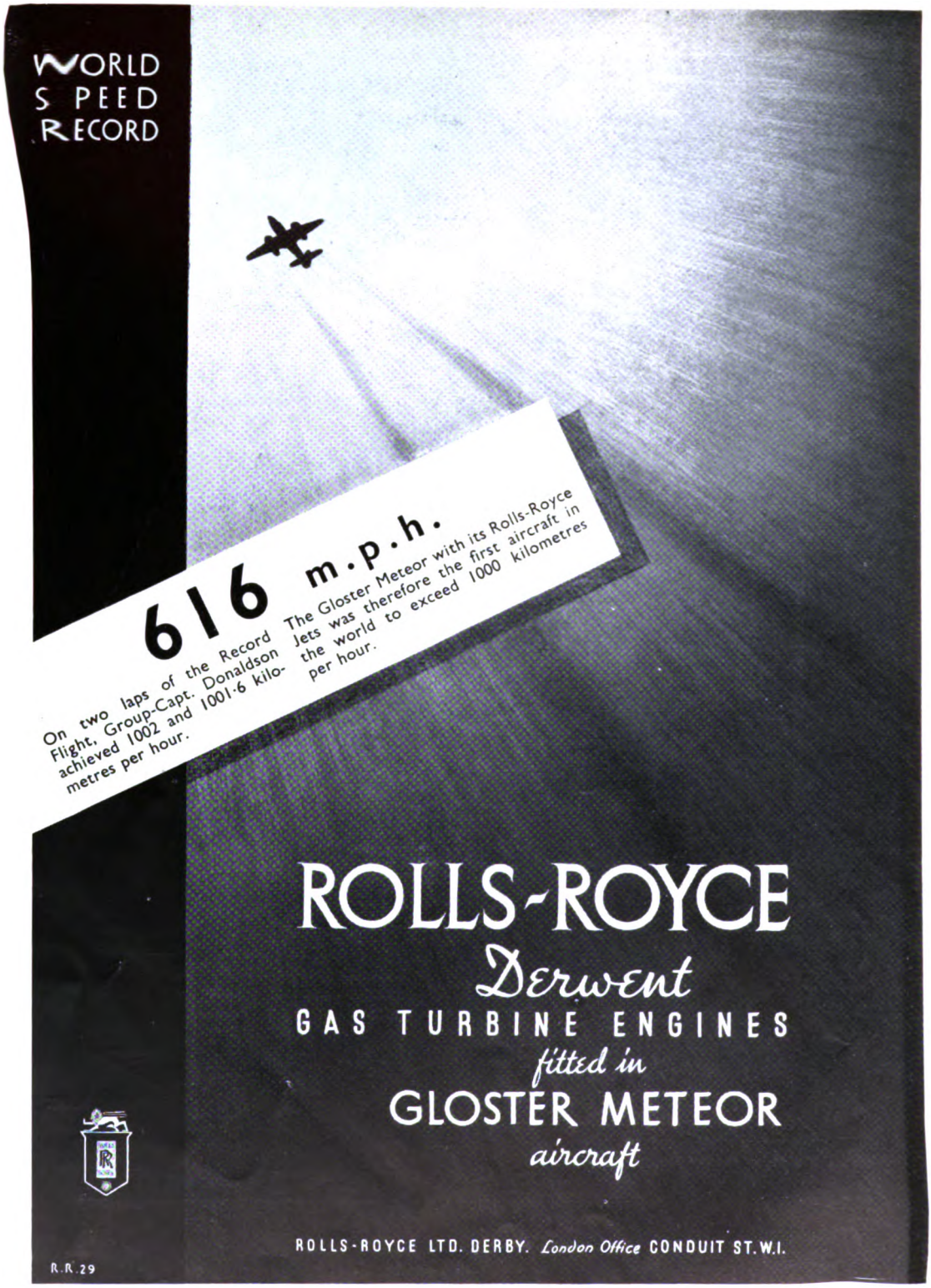
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EDITOR:
WING COMMANDER C. G. BURGE, O.B.E., q.s., R.A.F. (Retd.)
Assisted by an Advisory Committee of Members of the R.A.F. and Air Forces of the Dominions

VOLUME XVIII **DECEMBER, 1946** **NUMBER 1**

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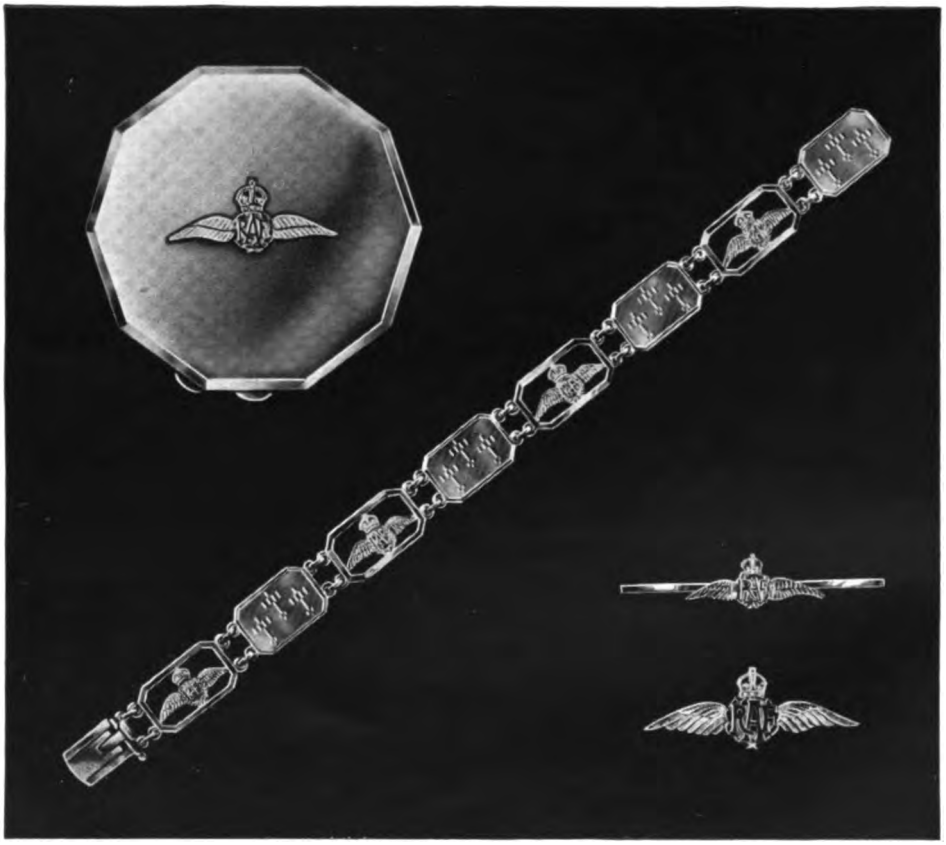

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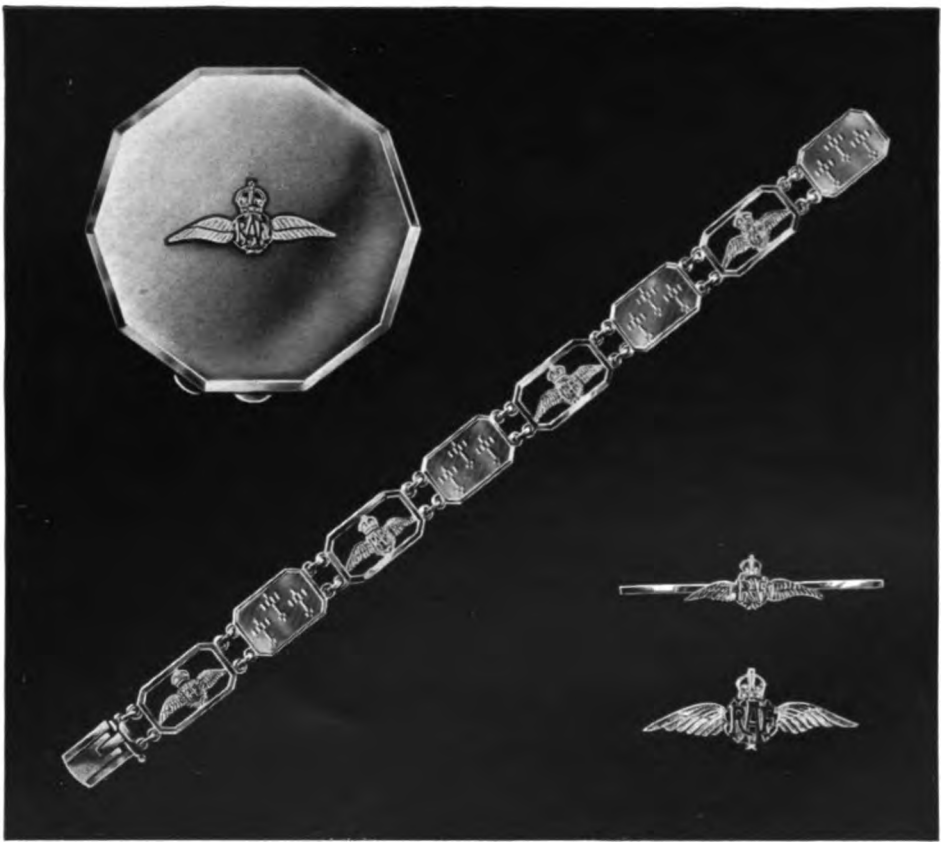

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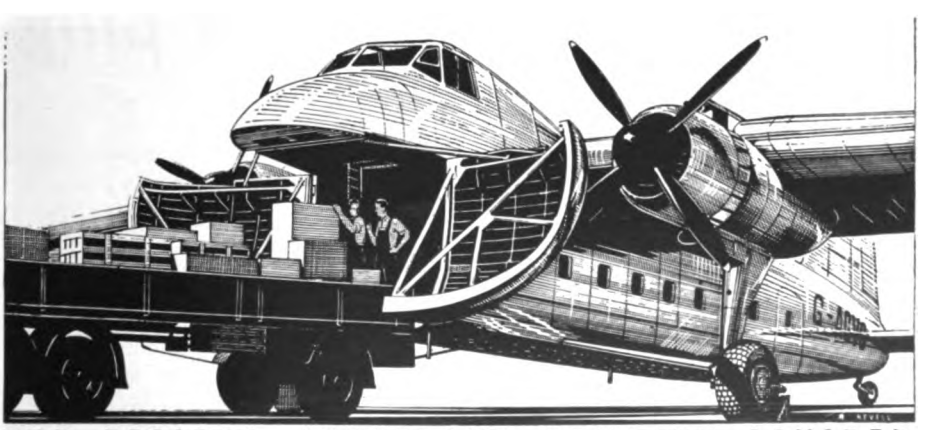

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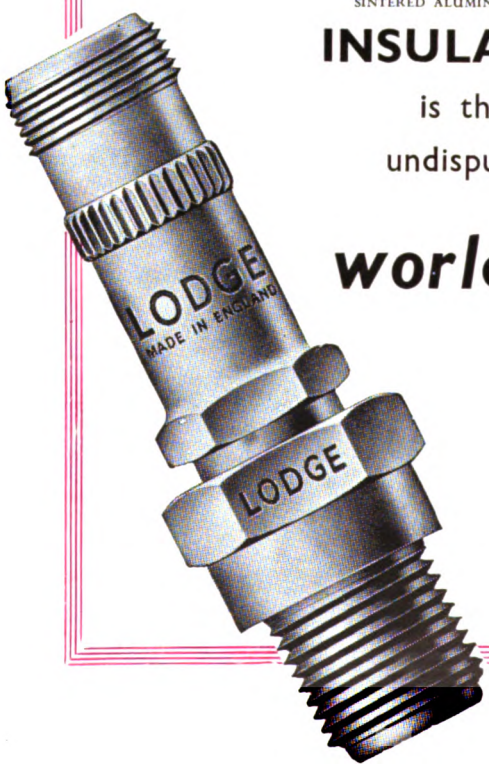

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Squadron, Address and Date Formed

500 (COUNTY OF KENT) SQUADRON
West Malling,
Maidstone, Kent, 16th March, 1931

Name and Address of the County Association

County of Kent Territorial Army and Air Force Association, Yeomanry House, Boxley Road, Maidstone.

501
(COUNTY OF GLOUCESTER)
SQUADRON
Filton, Nr. Bristol
August, 1929

County of Gloucester Territorial Army and Air Force Association, 2 Beaufort Road, Clifton, Bristol, 8.

502
(ULSTER) SQUADRON
Aldergrove, Crumlin,
Co. Antrim
May, 1925

County of Antrim Territorial Army and Air Force Association, 5 Bedford Street, Belfast.

504
(COUNTY OF NOTTINGHAM)
SQUADRON
Hucknall, Nottingham
April, 1928

County of Nottingham Territorial Army and Air Force Association, 6 Clinton Terrace, Derby Road, Nottingham.

600
(CITY OF LONDON)
SQUADRON
Biggin Hill,
Westerham, Kent
August, 1925

City of London Territorial Army and Air Force Association, Finsbury Barracks, City Road, E.C.1.

601
(COUNTY OF LONDON)
SQUADRON
The Hyde, Hendon,
N.W.9
August, 1925

County of London Territorial Army and Air Force Association, Duke of York's Headquarters, Chelsea, S.W.3.

602
(CITY OF GLASGOW)
Abbotsinch,
Renfrewshire
September, 1925

City of Glasgow Territorial Army and Air Force Association, 201 West George Street, Glasgow.

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603
(City of Edinburgh)
Turnhouse,
Edinburgh, 12
December, 1925

City of Edinburgh Territorial Army and Air Force Association, 7 Wemyss Place, Edinburgh, 3.

604
(County of Middlesex)
Squadron
The Hyde,
Hendon, N.W.9
17th March, 1930

County of Middlesex Territorial Army and Air Force Association, 20 Grosvenor Gardens, S.W.1.

605
(County of Warwick)
Squadron
Honiley, Kenilworth,
Warwickshire
August, 1926

County of Warwick Territorial Army and Air Force Association, 28 Jury Street, Warwick.

607
(County of Durham)
Squadron
Ouston, Stamfordham,
Newcastle-upon-Tyne
17th March, 1930

County of Durham Territorial Army and Air Force Association, Old Elvet, Durham.

608
(North Riding)
Squadron
Thornaby, Yorks.
17th March, 1930

County of York (North Riding) Territorial Army and Air Force Association, Thirsk Road, Northallerton.

609
(West Riding)
Squadron
Church Fenton,
Tadcaster, Yorks.
February, 1936

County of York (West Riding) Territorial Army and Air Force Association, 9 St. Leonards, York.

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610
(County of Chester)
Squadron
Hooton Park, Wirral,
Cheshire
February, 1936

County of Chester Territorial Army and Air Force Association, County Association Offices, Gilwern, Abbots Park, Chester.

611
(West Lancaster)
Squadron
Woodvale, Formby,
Liverpool
February, 1936

County of Lancaster (West) Territorial Army and Air Force Association, St. George Building, Lime Street, Liverpool.

612
(County of Aberdeen)
Squadron
Dyce, Aberdeenshire
1st June, 1937

County of Aberdeen Territorial Army and Air Force Association, 5 East Craibstone Street, Aberdeen.

614
(County of Glamorgan)
Squadron
Llandow, Cowbridge,
Glamorganshire
1st June, 1937

County of Glamorgan Territorial Army and Air Force Association, 6 St. Andrew's Crescent, Cardiff.

615
(County of Surrey)
Squadron
Biggin Hill,
Westerham, Kent
1st June, 1937

County of Surrey Territorial Army and Air Force Association, Vine House, Park Road, Surbiton, Surrey.

616
(County of Yorkshire)
Squadron
Finningley, Doncaster,
Yorks
November, 1938

County of York (West Riding) Territorial Army and Air Force Association, 9 St. Leonards, York.

Squadron, Address and Date Formed	*Name and Address of the County Association*
613 (City of Manchester) Squadron Ringway, near Manchester. February, 1939	County of Lancaster (East) Territorial Army and Air Force Association, Blackfriars House, The Parsonage, Manchester, 3.

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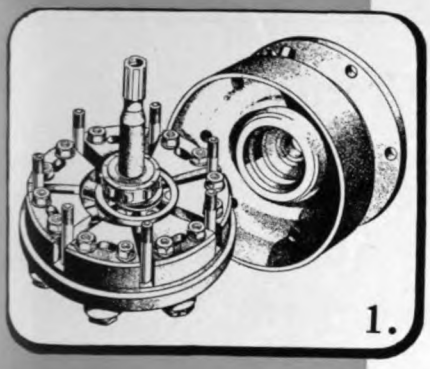

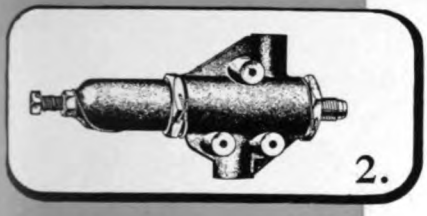

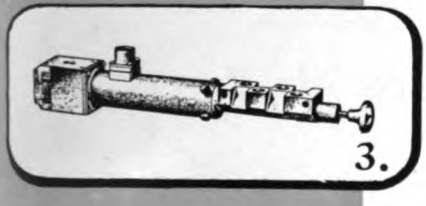

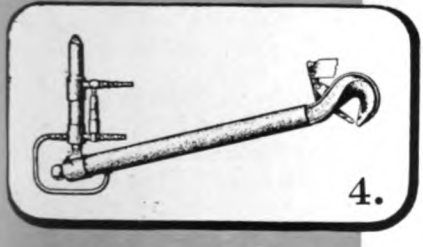

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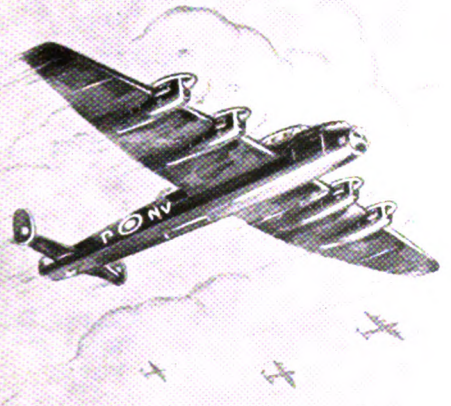

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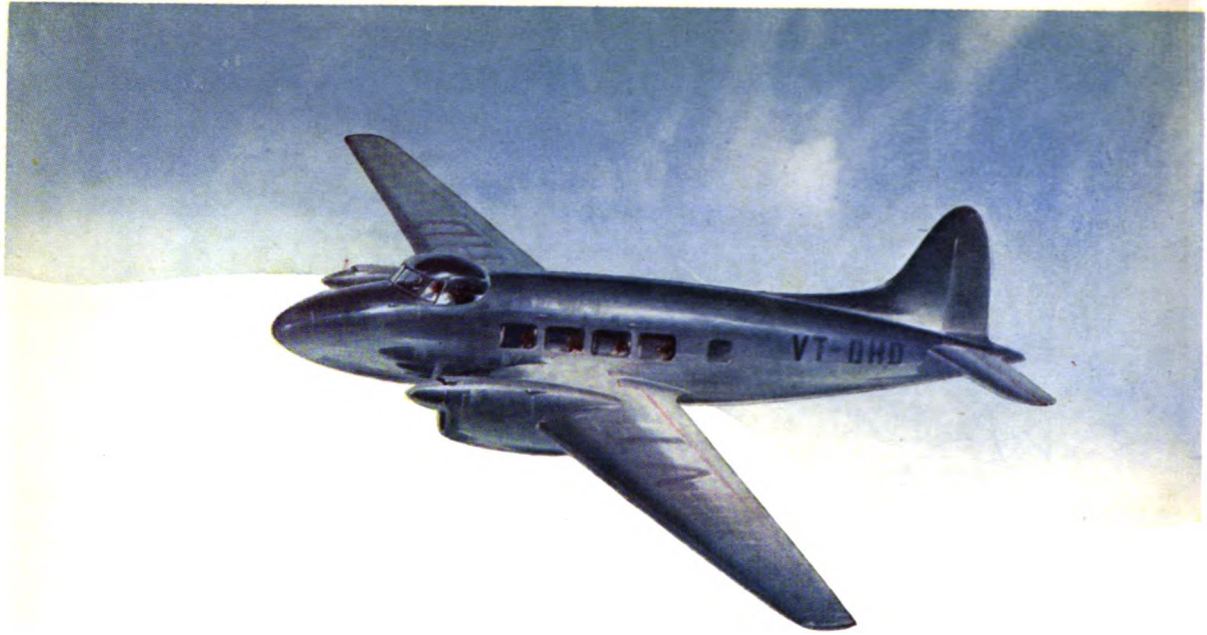

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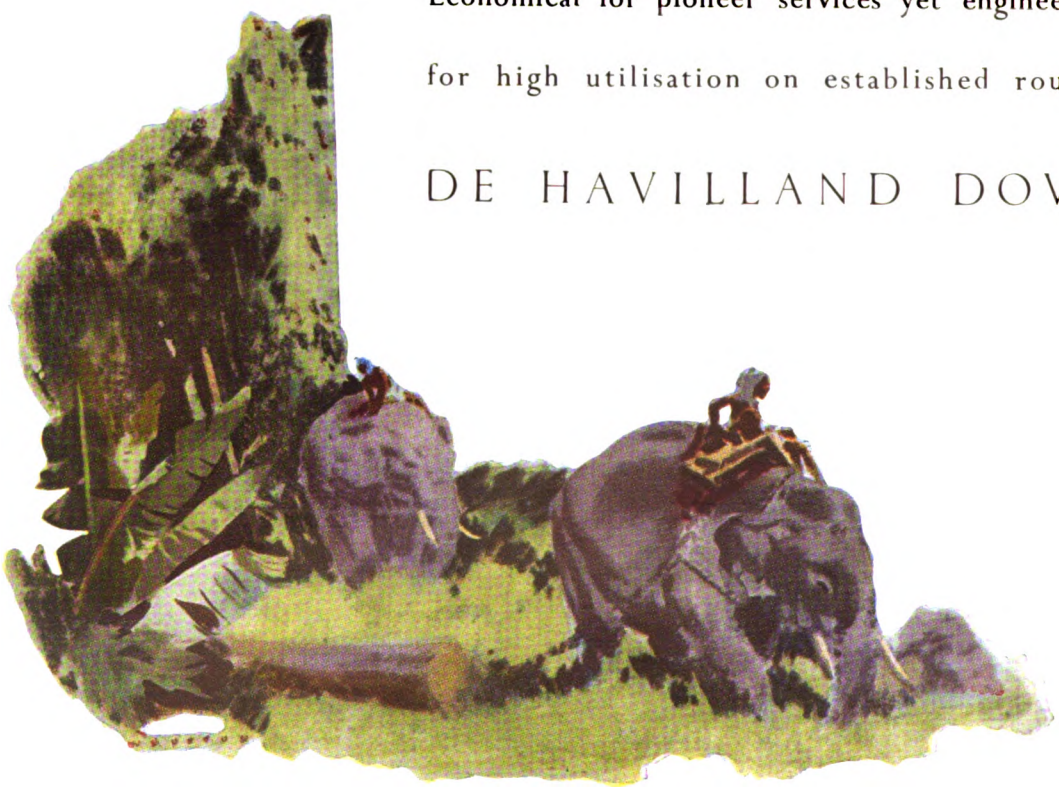

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The name and address of the competitor is to be inserted in a small sealed envelope attached to the inner envelope containing the two copies of the essay. These envelopes containing competitors' names will not be opened until the essays have been adjudicated.

Essays should be typed, but if this presents any difficulty they can be submitted in handscript providing this is legible. Closing date, 30th April, 1947.

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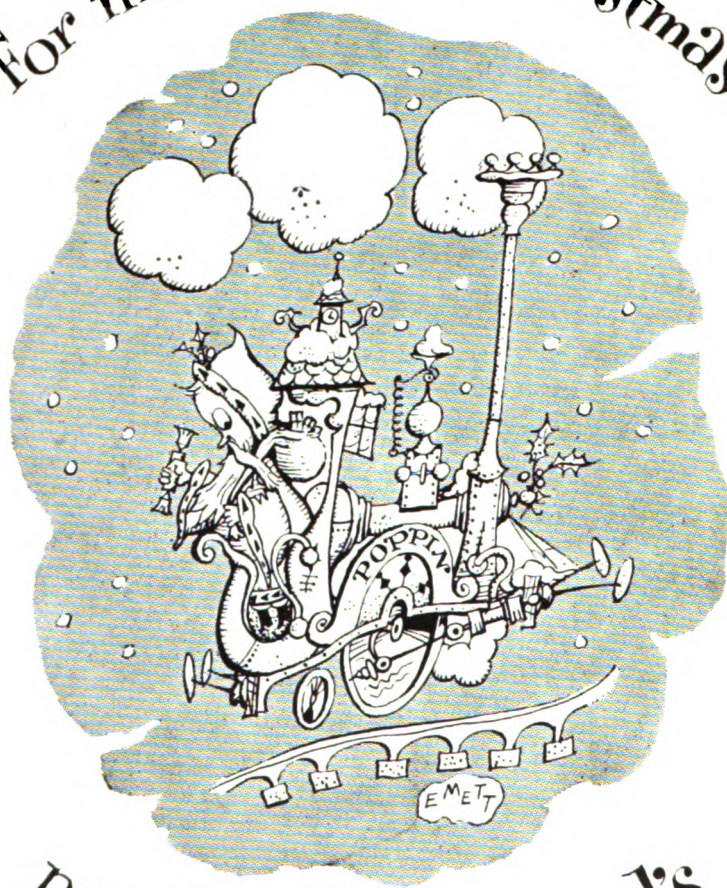

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The compassionate heart of the British public is perhaps in no sphere more surely expressed than in the Lord Roberts Memorial Workshops, established and maintained by voluntary donations for the benefit of severely disabled ex-Service men.

Hundreds of men, grievously disabled in battle, bereft of the means of making a living, are being received into the Workshops, trained in new trades and equipped to undertake remunerative work in the world.

Since 1914, when the Workshops were greatly enlarged, a magnificent work has been achieved. Men have learned successfully to overcome their handicap and with the restoration of their independence have regained their stability of outlook and sense of security. Permanent employment has been assured to those whose disablement is of a rate so high as to preclude their finding suitable work elsewhere than in these Shops where the machinery is specially designed for the use of those with a heavy disability handicap.

In these days following another world war, the first charge upon our plans for reconstruction is the resettlement of men and women returning from the Forces, and the Workshops, of which there are seven in the country and two additional factories in process of establishment, are making an invaluable contribution towards the rehabilitation of our disabled.

Today is the anniversary of Lord Roberts' birth; it was his ever-constant care of the welfare of ex-Service men that inspired the development of the Workshops at the time of his death on the battlefield in 1914. Now, as then, the urgency of such an effectual and beneficent work is vital, and large funds are needed for its expansion.

I therefore confidently commend the Lord Roberts Workshops to the generous support of all and ask for liberal donations—a fitting tribute to the memory of an illustrious soldier and a token of immeasurable gratitude for the service and sacrifice of the nation's disabled.

Every contribution sent me will be most thankfully acknowledged.

Yours faithfully,
CORK & ORRERY,
Admiral of the Fleet.
Hon. Treasurer, Soldiers' Sailors' and Airmen's Help Society (Lord Roberts Memorial Workshops),
122, *Brompton Road, Room* 32,
*London, S.W.*3.

30th September, 1946.

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To R.A.F. Benevolent Fund	£12	10	0
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IMPORTANT—See "WANTED" page 68

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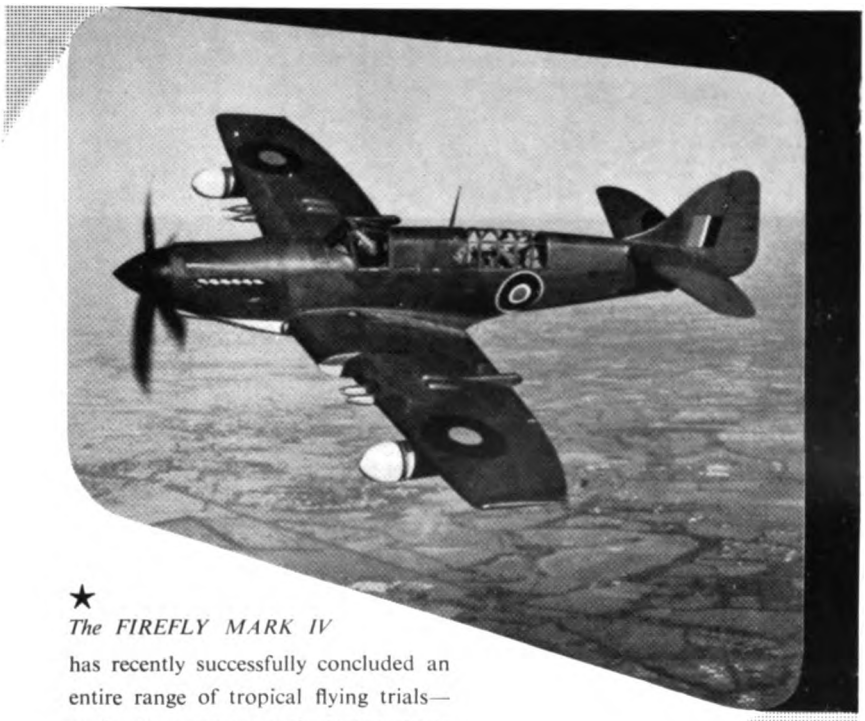

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EDITORIAL

I. World Affairs

IN the middle of October, 1946, the focus of interest in World Affairs moved from Paris to New York, from the preliminary Peace Conference to the Meeting of the General Assembly of the United Nations.

We welcomed the announcement by Mr. Ernest Bevin, and other prominent delegates, that the deliberations at Paris had not been entirely abortive. Perhaps we may be forgiven if we, like many of the general public, had become somewhat impatient of the seemingly endless talks and nothing done. But talk has its value. Only by frank and free discussion can situations so complex as the present state of international relationships be clarified. And this, we believe, has been done. Of course, nothing has been decided. The Peace Conference had not the authority to decide anything. The Peace Treaties will, in due course, be drafted under the direction of a subsequent meeting of the Foreign Ministers concerned; and after that they will have to be ratified by their respective governments before they become operative. Mr. Bevin has assured us that the ground has been well turned over, and the Foreign Ministers, when they come to the drafting of the treaties, will find their labours somewhat lightened by the work that has been done at Paris. In particular, they will be aware of the reactions of the medium and lesser Powers, without which it would be impossible to prepare satisfactory settlements. But the biggest task has yet to be undertaken—the treaty with Germany. That may well exercise the minds of diplomatists for many months to come.

One serious drawback, we think, is the modern practice of discussing these delicate and complicated matters in the full glare of publicity. Not that we would deny to the public full knowledge of what is going on. It is very important that the public should be fully informed. But it is impossible for delegates at an open conference to ignore the fact that everything they say may be immediately reported to their own people through the Press. The result is that they are often apt to speak with one eye upon their public, and that makes it all the more difficult to reach an agreement. We think that serious consideration should be given to the advisability of holding some, at least, of these international conferences *in camera*. The public rightly takes a keen interest in these matters which are bound to affect it very closely, since upon the settlements eventually determined will depend the future peace of the world. But the public has neither the time nor the opportunity to inform itself fully about the economic and political facts which are the raw material of treaties, and it is very apt to jump to conclusions and to form hasty judgments.

Another difficulty, as Mr. Harold Nicholson has ably pointed out, is that certain important words, such as "democratic" and "imperialistic," mean different things in Russia and in Britain. The difficulty is not in translation but in harmonizing the ideas which these words connote in the minds of the British and Russian peoples. There are differences in mental outlook between the Western democracies and the great Eastern European Power, and that probably accounts for most of the difficulties that faced the Peace Conference. And it is clear that these differences will have to be resolved before agreement can be reached.

And there is another obstacle to the speedy settlement of international relations. Mr. Noel Baker has already called attention, in the General Assembly of the United Nations at New York, to the too-frequent and dangerous use Russia has made of the right of veto in the Security Council. It will be recalled that it was Russia who insisted upon the right of veto being included in the Charter and that she made it the price of her membership of the United Nations. Those who framed the Charter had to decide whether to accept the principle of the veto or to lose the support of Russia. Whether it would have been wiser to omit the veto and to form a United Nations Organization without Russia we cannot say; but obviously the absence of the United States from the League of Nations accounted largely for the League's failure, and he would have been a bold man who would have advocated the formation of a second international organization with one of the greatest world powers outside of it.

While the Paris Conference was still in session a noteworthy contribution to the study of World Affairs was made by Field-Marshal Smuts, Premier of the Union of South Africa and one of the world's most astute statesmen. In a broadcast speech, relayed throughout the world, he lifted the topic into the calm atmosphere of long-term diplomacy. "We must look upon world peace," he said, "not as a mere accomplishment or waiting just round the corner, but as a long-

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range task, calling for a new spirit among the nations and for mighty efforts to achieve it. There is no short cut to the greatest goal of human welfare." We must not "put our faith in more machinery," but we must "build peace more securely on something enduring in the human spirit and in the evolving structure of our international society." During the past fifty years "we may have travelled only half-way through this great — perhaps the greatest — revolution of human history, after which the world may look very different even from what it is to-day." He did not exclude "the possibility that world peace may be found to depend ultimately on world government and on the erection of a world super-government for peace over and on the basis of subordinate national governments." For the time being, " unity among the Great Powers is essential for peace." " Any world war must be a war among the Great Powers, who command the war resources of the world; but in fact there is (at present) no major object for them to fight about." The Field-Marshal's broadcast was, as these quotations show and as he himself said, "no new message." He had "no programme to offer." Indeed the time is hardly ripe for the preparation of a new programme. The statesmen now in conference are but taking stock of the situation; and that is no easy or simple task, nor can it be accomplished in a short time. But, as we have said above, the interchanges of views that are taking place must ultimately clarify the issue and give to the leaders of every nation a more accurate idea of the needs and aspirations of the others. So the settlements, when they come, may be expected to be a considerable step in the right direction. The qualities most needed in the statesmen of to-day are sympathy and open minds; and among the people themselves, tolerance and patience. These things, we believe, are being acquired.

II.—The Nuremberg Judgment and its Implications

After a trial lasting eleven months, the verdicts of the International Tribunal on twenty-two men accused of "crimes against humanity" were announced at Nuremberg on 1st October, 1946. Of these twenty-two men, nineteen were found guilty on some or all of the four "counts," and three were acquitted. Twelve of those found guilty were sentenced to death and the remaining seven to various terms of imprisonment.

The trial was conducted by the best judges that could be found among the nations that won the war; and it may safely be assumed that everything possible was done to ensure that the trial was conducted with scrupulous fairness, that the accused were given every opportunity of defending themselves (with the help of counsel) according to the best practice of jurisprudence, and that the final judgments were just.

So ends a chapter in world history which will be regarded by future historians as a landmark in the development of international justice. But the matter does not end there. Indeed it may be said to have only just begun; for the implications of the judgment and its consequences are revolutionary and far-reaching. Behind the bare facts of the case are certain matters which it behoves every thinking man—every man who is interested in the welfare of the human race and in the development of international law—to consider. These may be summarized as follows: (i) the legality of the trial, (ii) the development of international jurisprudence, (iii) the "higher justice," and (iv) the application to Service chiefs of the principles upon which the judgment was based. They are briefly discussed below:

(i) *The Legality of the Trial.* It has been suggested—rashly, we think—that the main crime of which the condemned men were guilty was that of losing the war, or of being on the losing side. The only argument that can be used in support of this suggestion is that it was only because the Germans lost the war that their leaders were put on trial. Had they won the war, they would not have been tried; and they might even have put the leaders of the anti-Nazi and anti-Fascist nations on trial on charges, presumably, of " resisting just aggression." Though true in fact and logically sound, the argument is a specious one. For though the victorious nations naturally invoked a body of law which might be regarded as of their own choice if not of their own making, the principles upon which the charges were framed, and upon which judgment was delivered, are above the level of national law and are to be found in international law that is recognized by practically all the civilized nations. And the same answer disposes of the argument that the law by which the accused were judged was made after the commission of some if not all of the crimes for which they were arraigned; for if the making of law is regarded as a discovery rather than an invention (and it should surely be so regarded), then the discovery of law implies a pre-existing law and the law so discovered does not come into existence at the moment of discovery. So all good law, whether national or international, is that part of pre-existing law which the so-called law makers have succeeded in discovering at any given time.

Apart, however, from this fundamental consideration, it can be, and doubtless has been, proved that Germany had broken existing international law since she was a signatory of the

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Kellogg Pact, which expressly renounced the waging of aggressive war. And since a whole nation canot be tried and punished for such a crime, it is surely right that the men who lead a nation into breaking the law are the proper persons to be tried and their guilt or innocence declared. Whether, having been found guilty of breaking a law said to have been discovered after the commission of acts which that law declares to be criminal, these persons should have been punished: that is another question. We do not propose to discuss that question here.

(ii) *The Development of International Jurisprudence.* The Nuremberg Judgment is unique. It is the first time that nations have sat in judgment upon the leaders of other nations for waging aggressive war and for crimes against humanity. And it has established a precedent. To that extent it has greatly enriched the body of international law and has set an example by which international jurisprudence will be guided in future.

Declared law is a plant of slow growth. As far back as history reaches, and probably farther, families and tribes and nations have adopted laws or rules for the regulation of their internal affairs and for the conduct of their individual members. They have sought and found a *modus vivendi*, which they have adopted, modified and developed as time progressed. And what is law but a *modus vivendi*, a means whereby individuals can live together in peace and prosperity? So international law is a means whereby nations can live side by side in peaceful and prosperous intercourse. The Nuremberg Judgment is not only an important stage in the development of international law; it has also given the whole existing body of that law a greater prestige and a wider influence. Furthermore, it is a considerable step in the direction of establishing some sort of international controlling body that will be the forerunner of a World State, which everyone desires but which everyone finds so difficult to conceive and to establish.

(iii) *The "Higher Justice."* We suggested above that laws are discovered and not made; and this is apparent if law be regarded as a *modus vivendi*—a way of living. The suggestion is based upon the assumption that there is (not *will be*) some way in which all members of the human race can live peaceably, prosperously and happily together in their several parts of the world. The problem has been partly solved by the establishment of nation-states, whose laws provide a *modus vivendi* within their borders. But their peace is liable to periodical and violent interruption by the activities of other states. And the problem now is to extend our discovery of law until we have found how to settle international disputes without recourse to war, which really settles nothing. We believe that such law exists and is to be discovered. We are indeed well on the way to its discovery, having discovered parts of it already.

This is no new idea. It is as old as Plato, if not older. It is the idea that there is, laid up in heaven, a divine pattern of perfection and that it is man's destiny and privilege to seek and to discover this pattern bit by bit and, if he will, to adopt it. Though the search is long and difficult, man is not in fact without guidance. We may be permitted, perhaps, to point out that the great Hebrew prophets, and particularly Isaiah, contemplated circumstances in which all the nations of the world would live peacefully together, having discovered the divine pattern. And a clear indication of this pattern is given elsewhere in the words, "Thou shalt love thy neighbour as thyself." That is the higher justice—the proper relationship of man to man throughout the whole world. It is a mistake to think that there are different kinds of law as, for instance, laws for the relationships between individuals, between groups, between nations. Ultimately they are all based on the one fundamental question: How can a number of men and women live peacefully, happily and prosperously in the same world? That is the problem that lay behind the Nuremberg Trial and to the solution of that problem the Nuremberg Tribunal sought to contribute. Whether their judgment was based on national or international law, or any other law, it was based upon the higher justice which regulates man's dealings with his fellow men. The judgment was clear: "These things of which you, the accused, have been found guilty are crimes against humanity. They are not to be done." In this the Court invoked a higher code than that of national or international law; they referred to Plato's doctrine of the pattern laid up in heaven —the Law of God.

(iv) *Significance of the Judgment for the Chiefs of the Fighting Services.* For officers of the Royal Air Force and of the other Fighting Services, the Nuremberg Judgment has important implications. It established the personal responsibility of the leaders of the German armed forces and other Services for acts which they claimed to have done "in the execution of their duty." (They were not condemned solely on account of membership of organizations judged to be criminal.) The precedent created by the judgment will have general application in the future. And the question now to be considered is how far our leaders are to be held personally responsible for acts which they perform, or cause to be performed, in carrying out the instructions of their government. Are they in future to be arraigned before

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an international tribunal and judged by international law and the higher justice? The answer is apparently "Yes." We may be assured that they will not be found guilty of atrocities such as those of which the men condemned at Nuremberg were found guilty, for the simple reason that they would not do such things. But if another war breaks out, they may be arraigned before an international tribunal for their share in waging war. If it can be proved that the war they will have waged is a defensive war, presumably they will be acquitted. But if we lose that war, they will be liable to be arraigned before a tribunal established by, and consisting of judges nominated by, the victorious enemy; and there is no assurance that the law which that tribunal will administer and the procedure it will adopt will be as just as the law administered by, and the procedure adopted by, the tribunal at Nuremberg. It will be a law and procedure adopted by a different body of men with different ideas; and the waging of even a defensive war may be judged by that tribunal to be criminal.

Here an important consideration emerges. According to the British Constitution, the orders issued to the Navy, Army and Air Force are the responsibility of the Members of the Cabinet jointly and severally; the Cabinet is responsible to Parliament; and Parliament, at least the House of Commons, is responsible to the electorate which consists of all the adult members of the Nation. It was not so in Germany, which was a totalitarian State governed by a dictator. Would that make any difference? It depends upon the fundamental principles of justice adopted by whatever tribunal may be set up.

And again, it is an established and universally recognized principle in all the British Services, both military and civil, that an officer is bound loyally to give effect to the policy of his superior, whatever may be his personal opinion of that policy. It is the duty of a staff officer to issue, over his own signature, the orders of his chief and, as far as he can, to ensure that they are carried out. Even if he disagrees with the orders, he must in no way betray his disagreement. But suppose the orders he is required to issue appear to him to violate the canon of international law or what his conscience tells him is the higher justice! Some may say he should resign. But resignation is not so easy in time of war. It would be unpatriotic. The question is a very difficult one, and we do not attempt to answer it. We do, however, record an opinion that is being expressed in many quarters, an opinion that seems to be a development of the growing international conscience of mankind. The opinion is that there is a loyalty higher than loyalty to the State; that, in the immortal words of Nurse Cavell, "patriotism is not enough."

Quite recently we have been told of a number of Germans who were secretly enrolled in the British army to fight against Germany, men who we knew could be trusted to fight loyally on the side of the Allies. Some were in commandos and one at least was awarded the Military Cross. These men we rightly regard as heroes; but they fought against their own people, for conscience' sake. If Germany had won the war, doubtless they would have been hounded down and executed as traitors; just as William Joyce was executed as a traitor, though he may have conscientiously thought he was obeying a higher law by trying to persuade the British to give up the struggle. No doubt William Joyce was wrong. A man's conscience is not infallible; but to what higher authority can he appeal? Any officer may at any time find himself confronted with this dilemma; and, as we said, we can offer little help in coming to a decision. It is clearly a matter for individual judgment. One thing, however, we may be sure of: no British officer will allow the possibility of his having to answer before an earthly tribunal for his conduct to deter him from doing what he considers to be his duty.

III.—The Organization of Defence

1.—*The Ministry of Defence*

Elsewhere in this number of the Royal Air Force Quarterly we give a summary, with comments, of the White Paper published in October, 1946, which contains the proposals of His Majesty's Government for the co-ordination of defence at the highest levels. The main feature of the proposals is the establishment of a Minister of Defence (with a small Ministry), who will be a member of the Cabinet and will be responsible to the Prime Minister and the Cabinet for co-ordinating the strategical planning of the three Services and for allotting to each its proper proportion of man-power, money and supplies.

This step follows logically upon its predecessors in the gradual evolution of administrative machinery for the co-ordination of the work of the Services and is a direct development of Mr. Churchill's policy when he assumed the title of Minister of Defence as well as that of Prime Minister in 1940. This separation of the functions does not, nor is it intended to, relieve the Prime Minister of the ultimate responsibility for defence. That is and must always be the principal responsibility of the Prime Minister, since the work of all the Departments of State depends upon the security of the realm. But it is now considered expedient, in time of peace at least, that the functions of the

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Minister of Defence should be performed by a Minister with no other official responsibilities. This has the double advantage of leaving the Prime Minister free to direct the policy of the Government as a whole and to co-ordinate the work of all departments, and of providing the Fighting Services with a Minister who can devote his whole time and attention to their collective needs.

It has been suggested that one defect of the new plan is that it will deprive the three Service Ministers of Cabinet rank, and that they may lose status thereby. There seems to be no foundation for this fear. They will be represented in the Cabinet by the Minister of Defence through whom they will speak with one voice; and that has the advantage of removing from cabinet meetings the possibility of competition between the three Service Ministers. It also has the advantage of reducing the size of the Cabinet.

2.—*Training for Combined Operations*

"Training in combined operations," says the *Daily Telegraph* Military Correspondent, "is now regarded as basic in all three Services." The reasons for this are obvious. If the war has taught us anything, it has taught us above all: (i) that combined operations are of the greatest importance; (ii) that their proper technique must be carefully studied; and (iii) that adequate instruction in the principles so evolved, and training in their application, must be given to selected officers and men of all the three Services. Not only the landings in Sicily, Italy and Normandy, but also the whole of the campaigns in Burma and the Far East were combined operations on a grand scale.

From the innumerable small commando raids on the enemy's coasts, carried out for the purpose of gaining information or of destroying fortifications and other installations, through the bigger raids such as St. Nazaire and Dieppe, to the landings in force in Sicily and Italy and finally to that gigantic combined operation, the Normandy Landings in 1944, the principles of effective co-operation between the three Services have been steadily developed. Indeed it is virtually true to say that all major operations of modern war, and many minor ones, are combined operations involving the co-operation of at least two of the three Services. The Army and the Air Force are in constant co-operation, and it is only the fact that the Navy has its own air arm that renders it a degree less dependent upon the Air Force. If the distinction is between the elements on or in which operations take place and not between the Services operating, the principle becomes more apparent. Land forces and sea forces both need air cover and air support wherever they are operating; and the air arm itself must rely upon the land and sea forces for its supplies and to consolidate its gains.

In order to provide adequately for the study and practice of tactical co-operation between the Services, the School of Combined Operations has been established in North Devon, under its Commandant, Major-General G. E. Wildman-Lushington, Royal Marines. The staff is naturally drawn from all three Services. Courses at present last for five weeks, and consist of forty officers: twenty from the Army, ten from the Navy and ten from the Air Force. The main object of the courses is to teach the officers of each Service the capabilities and limitations of the others, and this is done by lectures and by practical demonstrations on the "model." Every phase of an opposed landing is represented on the model, which includes a wide variety of vehicles and of airborne and waterborne craft as well as figures representing formations of the three Services.

In addition to the School of Combined Operations, a number of other establishments and units are, or will be, at the disposal of Combined Operations Command, *e.g.*, a Combined Operations Signal School; Combined Training Establishments for whole units; the Royal Naval Assault Force, which can "lift" a brigade; the Combined Operations Experimental Establishment; a Beach and Boat Section; a Bombardment Troop; an Amphibian Support Regiment, Royal Marines; a Commando Brigade, Royal Marines; and a Combined Operations Beach Group (probably a unit of the Territorial Army).

3.—*Transfer of Middle East Bases*

The national Press has recently reported a proposal to transfer Britain's defence bases from the Eastern Mediterranean to Kenya and Tanganyika in East Africa. To most of those who have been brought up in the old traditions of Imperial strategy, this will appear revolutionary in the extreme. But a moment's reflection will suffice to bring recognition of the fact that the strategical situation itself has been undergoing a revolution ever since the end of the first world war, a revolution that has gathered momentum as it proceeded. It need not therefore be surprising if great changes in strategy should follow great changes in the situation. Let us consider them.

Egypt can no longer be used as a naval, military and air base, as we have promised to remove all our troops within a short space of time. Palestine and Transjordan are small, and communications with those lands are inadequate for rapid reinforcement, while the political situation in Palestine renders that country unsuitable as a

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base. Iraq is at present an uncertain quantity; we may have to pull out of there if the Iraqis ask us to. The recent war has shown how dangerous a sea the Mediterranean can be with a strong hostile power dominating its northern shores. And even though the Suez Canal were kept open, the Red Sea might become unsafe for the passage of men and material to and from bases in the Middle East, if Iraq and parts of the Arabian peninsula were occupied by an enemy provided with powerful air forces. So any base in the Eastern Mediterranean might become a death-trap to its unfortunate garrison, which could be bottled up and unable to get out except by air.

Another reason for the proposal is that we have adopted the policy of handing India over to the Indians. We can no longer count on India as a base for the Indian Ocean. Though India may be as loyal as any other Dominion, we cannot, in the present delicate circumstances, prejudice her independence by assuming anything of the sort and acting upon such an assumption. Hence bases on the western shores of the Indian Ocean become vitally necessary to maintain communications with Australia and New Zealand, with the small outposts of Singapore and Hong Kong, and with our countless island possessions in Eastern waters. The Union of South Africa has declared its willingness to have Durban developed as a naval base.

By way of objection to these proposals, it has been represented that Turkey and Iraq would be isolated, and either or both might fall an easy prey to any powerful hostile neighbour. And if there are no British forces in the Middle East, which is noted for its strategical importance as the meeting-point of three continents and for its political instability, it seems likely that some other great power would step in to fill the vacuum. Moreover, it is urged that the absence of British armed forces from the Middle East would seriously reduce our diplomatic influence in that area. There are several very important treaties to be negotiated in the near future—with Egypt, with Iraq, with Persia and perhaps with Turkey; and the deplorable state of affairs in Palestine calls for wise and patient statesmanship backed by adequate armed forces.

As usual, the arguments on both sides are strong; but it would appear that those in favour of the proposal are the stronger. Perhaps the solution will be found in making East Africa and Natal our main bases while keeping small but well-armed garrisons in Palestine (for a time at least) and in Iraq—the latter to protect our oil interests in the Persian Gulf, from whence our forces in and around the Indian Ocean would draw their supplies of fuel.

Co-Ordination of Defence

PROPOSALS BY HIS MAJESTY'S GOVERNMENT

A Summary with Comments

HISTORICAL

IN October, 1946, the Prime Minister presented to Parliament in the form of a White Paper (Cmd. 6923—price 2d.) the Government's proposals for the Co-ordination of Defence. These proposals do not involve any drastic break with the past: they are rather designed to carry a stage farther the process of steady evolution through which our central organization for defence has developed during the past forty years.

The White Paper begins with a brief historical review. Our central organization for defence may be said to have begun in 1904, as a result of criticism of our military machinery whose defects became all too apparent during the Boer War. The first fruit of this movement was the Committee of Imperial Defence in May, 1904. This was an advisory body with the Prime Minister as its Chairman and only permanent member; and he was given absolute discretion in the selection of persons to attend its meetings, thereby securing to the Committee both authority and flexibility. For ten years before the First World War broke out in 1914, the Committee of Imperial Defence did invaluable work in formulating the principles which should govern our defence policy and in planning the transition from peace to war; and it must be given most of the credit for the smoothness with which we mobilized our slender forces, transported our expeditionary force across the Channel and deployed it beside the French armies to meet the advancing Germans. It also deserves credit for concerting the actions of all Government departments during the war. The Committee of Imperial Defence was not designed to take executive control in war, and it was not until late in 1916 that the War Cabinet was established to perform this function. Still there was no Government machinery for inter-Service planning, nor was any created during that war. In 1923, however, the Salisbury Committee drew attention to this need, which had become more apparent and urgent by the creation of the Royal Air Force in April, 1918; and in 1924 the Chiefs of Staff Committee was established and the foundations of the Joint Staff System were laid. This organi-

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zation was developed during the fifteen years preceding the outbreak of the Second World War in 1939, and a Minister for the Co-ordination of Defence was appointed in 1936 to superintend the carrying out of the rearmament programme.

So, when war broke out in 1939, our plans were fully prepared both for the transition from peace to war and for the setting up of machinery for the conduct of war. A War Cabinet was again established, advised and assisted by the Chiefs of Staffs Committee and other committees of the Committee of Imperial Defence; the post of Minister for the Co-ordination of Defence, whose position had now become anomalous, was abolished in April, 1940, and Mr. Churchill, on becoming Prime Minister, assumed also the title of Minister of Defence. Two Defence Committees were set up: one for Operations and one for Supply. The Defence Committee (Operations) consisted of the Prime Minister and Minister of Defence (in the Chair), the Deputy Prime Minister, the Foreign Secretary, the Minister of Production, and the Service Ministers with their Chiefs of Staff; and other Ministers were co-opted as and when required. This Committee examined the military plans prepared by the Chiefs of Staff and Joint Staffs and took decisions on behalf of the War Cabinet. The duties of the Prime Minister as Minister of Defence were never defined. Mr. Churchill was left to develop them and to provide the drive necessary to the conduct of war.

In the course of this development, certain changes affecting the position of the Service Departments gradually took place. The Service Ministers continued to be associated with the operational conduct of the war through their membership of the Defence Committee; but the Chiefs of Staff, in their corporate capacity, became the authority which issued to Commanders-in-Chief unified operational instructions and strategical guidance on the conduct of the war. The responsibility for the day-to-day administration of the Services remained with the Service Departments, who followed up the central directives issued by the Chiefs of Staff with detailed instructions to their own Commanders-in-Chief on such matters as the composition, equipment and movement of the forces under their command, and the provision of reinforcements and supplies. The corporate authority of the Chiefs of Staff in the higher direction of the war, under the immediate supervision of the Prime Minister, was further consolidated, after the entry of the United States into the war, by the institution of the Combined Chiefs of Staff in Washington, by the appointment of Anglo-American Supreme Commanders, and by the close relations which developed between the President of the United States and the Prime Minister of the United Kingdom. No Ministry of Defence was created during the war.

The Case for a Unified Defence Policy

The foregoing historical summary shows that both in 1914 and in 1939 collaboration between the military and civil departments of government was adequately provided for. But in 1939 we were dangerously unprepared in other ways. The Navy was seriously short of destroyers and other escort vessels; the Air Force was inadequately supplied with aircraft and anti-aircraft artillery; and the Army was too small and badly equipped; and it had so little munitions production behind it that, if the fighting on the Continent had been prolonged, we should soon have been short of every kind of ammunition. This state of unpreparedness was largely due to political and economic causes operating between 1929 and 1939 One serious defect, however, in our peace-time organization had contributed to this unpreparedness: the Committee of Imperial Defence had no machinery for formulating a unified defence policy for the three Services. The strengths and organization of the three Services were determined separately, each without reference to the others or to the problem of defence as a whole; whereas all these separate details should have been planned as interacting and interdependent parts of the main problem of defence. The Minister for the Co-ordination of Defence could not do this. His duties were strictly limited to co-ordinating, he was given no executive authority, nor was he responsible to Parliament; and he had no jurisdiction even over the apportionment of the available resources between the three Services. During the war, a unified defence policy was achieved by the assumption of executive control by the Prime Minister and Minister of Defence. How is it to be achieved in peace?

One method would be to amalgamate the three Services completely and to place them under a single Minister of the Crown. But His Majesty's Government do not consider the time is ripe for any such revolutionary change, though they do not exclude the possibility of its becoming desirable at some future date. The formation of a Combined General Staff has been suggested as a possible solution, to replace and take over the functions of the Chiefs of Staff Committee and the Joint Staffs for planning, intelligence and administration on the lines of the German *Oberkommando der Wehrmacht* (*O.K.W.*). But investigation into the workings of the O.K.W. have revealed defects which proved disastrous. The cleavage between planning and execution often resulted in the production of unworkable plans

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and entirely nullified any theoretical advantage of the German system. It has always been a cardinal principle of the British organization that, alike in the Chiefs of Staff Committee and in the Joint Staffs, it should be the men responsible in the Service Departments for carrying out the approved policy who are brought together in the central machine to formulate it. The soundness of this principle has been amply proved in practical experience in war. The methods employed in the British organization were adopted without alteration in the machinery of the Combined Chiefs of Staff, and at various Anglo-American headquarters formed in the field. Another suggestion that the Chiefs of Staffs Committee should have an independent Chairman can be met by the fact that the Prime Minister can, and often did during the war, preside over its meetings, directing its work in accordance with the general situation, obtaining its professional advice and informing it of political matters that had military implications.

Proposed New Organization

We now come to the concrete proposals of the White Paper. Some changes are required in order to consolidate the advances which have been made in recent years under the compulsion of war or the threat of war. Above all, experience during these years has shown the need of a Minister who has both the time and the authority to formulate and apply a unified defence policy for the three Services; and it is proposed that this need should be met by the creation of a Ministry of Defence. The form of the new organization proposed may be summarized as follows:

1. The Prime Minister will retain the supreme responsibility for defence.

2. The Defence Committee, under the Chairmanship of the Prime Minister, will take over the functions of the old Committee of Imperial Defence, and will be responsible to the Cabinet both for the review of current strategy and for co-ordinating departmental action in preparation for war.

3. A new post of Minister of Defence, with a Ministry, will be created. The Minister of Defence will be responsible to Parliament for certain subjects, which are defined below, affecting the three Services and their supply. In addition he will be Deputy Chairman of the Defence Committee, and he will also preside over meetings of the Chiefs of Staff whenever he or they so desire.

4. The Chiefs of Staff Committee will remain responsible for preparing strategic appreciations and military plans, and for submitting them to the Defence Committee, and the Joint Staff system will be retained and developed under their direction.

5. The Service Ministers will continue to be responsible to Parliament for the administration of their Services in accordance with the general policy approved by the Cabinet and within the resources allotted to them.

The above summary is elaborated in the following paragraphs.

The Defence Committee.—The appointment of a Minister of Defence will relieve the Prime Minister of that part of his general responsibility for national defence which is concerned with the inter-relation of the three fighting Services and their supply. But the problems of the organization for national defence in its broader aspect, since they engage the collective responsibility of the Cabinet as a whole, must be handled under the authority of the Cabinet itself. It is proposed that the Defence Committee should deal with these problems, under the Cabinet. The Prime Minister will be Chairman of the Defence Committee. Its composition will be flexible. The Prime Minister, the Minister of Defence, the Lord President of the Council, the Foreign Secretary, the Chancellor of the Exchequer, the Service Ministers, the Minister of Labour and the Minister of Supply will be regular members of the Committee, and the Chiefs of Staff will be in attendance. Such other ministers, officers and officials as may be required will be invited to attend meetings of the Committee, according to the subjects under discussion. The Prime Minister must be Chairman of the Defence Committee; but when international relations are stable, it will be neither possible nor necessary for him to attend all its meetings, and then the Minister of Defence will deputize for him.

Functions of the Minister of Defence.—Apart from his duties as Deputy Chairman of the Defence Committee, it is proposed that the Minister of Defence should be responsible for the following functions:

(*a*) The apportionment, in broad outline, of available resources between the three Services in accordance with the strategic policy laid down by the Defence Committee. This will include the framing of general policy to govern research and development, and the correlation of production programmes;

(*b*) The settlement of questions of general administration on which a common policy for the three Services is desirable; and

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(c) The administration of inter-Service organizations, such as Combined Operations Headquarters and the Joint Intelligence Bureau.

The Apportionment of Resources.—The new organization must be such as to ensure that the resources available for defence are laid out to the best advantage in terms of manpower, weapons and equipment, works services, amenities, etc. The Chiefs of Staff will advise the Defence Committee on our strategic requirements from year to year. It will then be for the Service Departments to translate these requirements into terms of men, money and supplies, and for the Defence Committee to co-ordinate the results. Peace-time production programmes cannot be determined without regard to questions of war potential.

Administrative Questions of Common Interest to the Three Services.—Within the resources allotted to them, the Service Ministers will continue to be responsible to Parliament for the maintenance and administration of their own Services.

Administration of Inter-Service Organizations.—The Minister of Defence will assume control of inter-Service organizations such as Combined Operations Headquarters, the Joint Intelligence Bureau and the Imperial Defence College, and their staffs will be borne on his vote.

Relations of the Minister of Defence with the Chiefs of Staff.—No change is contemplated in the organization of the Chiefs of Staff Committee, which will continue as at present, together with the Joint Staffs for strategic planning, intelligence and administrative planning. The Chiefs of Staff Committee will retain their responsibility for preparing strategic military plans and submitting them to the Defence Committee. On all technical questions of strategy and plans, it is essential that the Cabinet and Defence Committee should be able to have presented to them, directly and personally, the advice of the Chiefs of Staff as the professional military advisers of the Government. Their advice to the Defence Committee or to the Cabinet will not, therefore, be presented only through the Minister of Defence.

Formulation of Policy for Research and Development.—For this purpose there will be a Committee on Defence Research Policy, consisting of those responsible, both from the operational and scientific angles, for research and development in the Service Departments and the Ministry of Supply. Its Chairman will be a scientist of high standing, appointed for the purpose for a period of years. (The Prime Minister has since nominated Sir Henry Tizard, President of Magdalen College, Oxford, for this appointment.)

Home Security.—In any future war, the problems of home security will assume an importance even greater than that which they had in the late war; but His Majesty's Government do not propose to extend the functions of the Minister of Defence to cover this field. It will be the duty of the Defence Committee to link home security problems to broad defence policy, and the Home Defence Committee has already been reconstituted for the purpose.

Ministry of Defence.—The functions assigned to the Minister of Defence are such that it will not be possible for him to operate only through a small Secretariat. He will therefore need a Department with a separate vote.

Through the central machinery described above, His Majesty's Government will discharge their responsibility for organizing the defence of the United Kingdom. Our defence problems cannot, however, be viewed in isolation. We must be ready to play our part in any measures of collective defence which may be organized under the ægis of the United Nations, and we must maintain and develop our machinery for collaboration in the defence of the British Commonwealth and Empire.

Methods of collaboration between the various members of the Commonwealth are governed by the principle enunciated in the Statute of Westminster. Even before 1923 the conception that there should be a central authority in London, representative of all the self-governing members of the Commonwealth, to review defence questions and prepare central plans which would be binding on the whole Commonwealth and Empire, was never recognized as practicable even if it were desirable; nor is it now. Co-operation in Commonwealth Defence has therefore always taken the practical form of promoting uniformity of organization, training and equipment of military forces, maintaining the closest possible touch between staffs, and interchanging officers in order to promote a common doctrine and outlook in military affairs. Collaboration in war-time between the naval, land and air forces from different parts of the Commonwealth has thus been easy and effective.

Since 1923 the natural tendency of the different parts of the Commonwealth to view problems from their own individual standpoint has become more marked; and, as a result, the natural starting point for future progress has been the idea of *regional association.* His Majesty's Government have, therefore, proposed that there should be established, in the capital of each of the Dominions, United Kingdom liaison officers who could join with the Dominion

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Chiefs of Staff in studying regional security problems. Similarly they have proposed that Dominion Governments should appoint liaison officers in London.

For the defence of the Colonial Empire His Majesty's Government in the United Kingdom is directly responsible. The two main objects to be achieved in this field are: first, the security of the Colonies themselves from external attack, and, secondly, the development of the full resources of the Colonies in the event of war. Plans and preparations for Colonial Defence thus fall within the general scope of the defence measures for which the United Kingdom Government is primarily responsible, and to meet these requirements it is proposed to revive the Oversea Defence Committee as a sub-committee of the Defence Committee in London.

Such, in outline, is the higher defence organization which His Majesty's Government have decided to introduce. The changes proposed are based on the experience of the last decade, and are designed to place on a secure foundation, and to carry forward into peace, the machinery for inter-Service co-operation which worked so smoothly and effectively in war. The Government are satisfied that the functions of the various parts have been defined with sufficient precision to enable the duties to be carried out effectively, while at the same time the organization as a whole remains sufficiently flexible to allow the process of evolution to continue, as it has throughout this century, so that the central machinery for defence may be progressively adapted to changing needs.

Comments

The general opinion of these proposals is that they are a "sound adaptation of war-time practice" (*Sunday Times*). They were introduced in the House of Commons by Mr. Attlee in a very able speech on 30th October, 1946, and debated on that and the following day. They were welcomed by all parties.

The outstanding feature of the new scheme is, of course, the establishment of a Minister of Defence in peace-time, and the selection of Mr. A. V. Alexander for this responsible post has met with general approval. Other important features are that the Service Ministers will no longer be Cabinet Ministers; and the establishment of a Committee for Defence Research Policy. The latter is most necessary in view of the increasing speed at which technical development takes place, while the former has the double advantage of reducing the size of the Cabinet and removing from its discussions all competition between the three Services. And there is clear indication that we are to have no Combined General Staff, at least for some considerable time.

The Minister of Defence will be much more than an understudy of the Prime Minister, though he cannot relieve the latter of the ultimate responsibility for defence. He will, in effect, be the Minister responsible to the Prime Minister and the Cabinet for the efficiency and harmonious working of all the combatant Services in preparation for, and in the conduct of, war. In this truly British way it is hoped that we shall succeed in unifying the war effort without causing the Fighting Services to lose their individuality.

The principal defect of the scheme is, of course, that it makes practically no concrete proposals for collective defence under the United Nations or for really integrated defence of the Commonwealth and Empire. The first can hardly be planned until we know more of what our obligations and commitments are likely to be, and the second is a matter for joint decision by the Governments of all the self-governing parts of the British Commonwealth; so perhaps we could not expect any such concrete proposals at the present time.

In favour of the scheme, *The Times* has a significant paragraph in its leading article of 1st November, 1946: "While the creation of the Ministry strengthens the Cabinet by reducing its numbers, it should make defence more effective by concentrating decision in the various ways defined by the Prime Minister. In the formulation of unified strategy, the Minister can assist the Chiefs of Staff by presiding over their Committee whenever a non-technical chairman is likely to be useful. He will correlate production through a committee on which the Ministers of Labour and Supply will sit, and scientific development through the Defence Research Committee. Fourthly he will provide for inter-Service collaboration through the Committee of the Service Ministers themselves. Finally, he cannot help occupying an immensely strong position on the crucial question of finance in its broadest economic sense. It will be for him to put forward the expert estimate of what proportion of the national resources the needs of national security demand; and, were his estimates to be denied, his resignation would be a public warning of much more startling effect than ever attached, under the old system, to that of the merely departmental head of the Admiralty or War Office." This last point we consider one of the most important, and it may well prove to be the most valuable implication of the new scheme.

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World Peace and the Balance of Power

General

THE policy of maintaining a Balance of Power is considered by some to be a policy which must divide Europe, or the world, or whatever group within which it is practised, and prevent any possibility of unity; others hold that it provides protection for weaker communities which must succumb if the balance is destroyed.

Definition of the Balance of Power and its Application

The *Encyclopædia Britannica* defines the Balance of Power as a " phrase for such a just equilibrium between the members of the family of nations as should prevent any one of them from becoming sufficiently strong to enforce its will upon the rest. . . . Equilibrium between the powers is essential to the very existence of international law. . . . Otherwise nothing can prevent any State sufficiently powerful from ignoring the law and acting solely according to its own convenience."

Great Britain's traditional policy in conformity with the maintenance of the European balance has been to ally herself with the second most powerful nation on the Continent. Thus the most powerful nation of all was either defeated or intimidated by the combination of the second most powerful nation with Great Britain. Britain's first departure from this policy took place after the First World War and proved disastrous; she pinned her faith to collective security under the League of Nations, abandoning her alliance with France against the German threat of supremacy.

Although the old policy of preserving the Balance of Power is reviled as provocative and despised as obsolete, it remains nevertheless the one tried way of maintaining peace; Britain would only be following the old tried rules if she devised a means of holding this balance. In Europe now there is no balance. Russia is strong enough to enforce her will upon the rest one by one, no matter which single power in Europe Britain may choose to support. A variation of the old practice is therefore necessary. The only prospect of maintaining equilibrium is for Great Britain to conclude an agreement with France to which smaller nations must adhere. They are all willing to combine and only waiting for a lead. The acceleration of communications and the greatly increased power of weapons and machines do not change the concept fundamentally. They may and do bring in extra-European nations as factors, but the need for maintaining the international equilibrium in Europe still remains.

Balance or Over-Balance of Power

F. A. Voight has recently written, in the *Nineteenth Century and After*: " There are two ways of achieving security, and neither is infallible; but there are no other ways. The two ways are: *Balance of Power*, which is, or was, the British way; and *Over-Balance of Power*, which was once the French way, twice the German way and is now the Russian way."

If Mr. Voight is right in supposing that Russia is following a policy of "Over Balance of Power" —and very possibly he is—nothing, except a change in Russian policy, can prevent another war. For there is one international condition which cannot be tolerated under any circumstances by this country, and that condition is a world threatened by a nation which sees security only in domination. If this condition exists, our diplomatic efforts can only be directed towards obtaining the most favourable conditions for the struggle. It is wrong to suppose, however, that an exact Balance of Power is necessary to the security of this country. An overwhelmingly powerful U.S.A., for example, would not, in fact, be a threat to world peace; since the U.S.A. is a stable element in international affairs. A deliberate policy of aggression and domination would be contrary to her democratic tradition and so improbable that it can be disregarded.

Collective Security and the Balance of Power

The collective security scheme was found to be worthless in practice because no means existed to enforce action by its supporters when the need arose to chastise an offender. Now the United Nations Organization takes the place of the League of Nations. Its chief aim is the establishment of an international or super-national force, under the direction of the Security Council, for use as a big stick to be wielded against an aggressor. This force may be the ultimate solution, but Great Britain should not forsake her old policy until this force is securely established.

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Britain and a Western European Group

Britain cannot compete against Russian infiltration, agitation and pressure, either alone or with the help of the Commonwealth. If relations with Russia deteriorated and war broke out, we could at best accept a stalemate. British reluctance now to support, by close liaison, the democratic forces in Western Europe only strengthens pro-Russian elements. Britain must develop a Western European group of powers. By all means let her maintain her associations with the U.S.A. and strengthen the links that bind the Commonwealth together; but these arrangements must be complementary, not supplementary, to the formation of a Western Union as a balance against Russian power in the East. The Union would be based upon alliance with France. Associated, by mutual defence and other agreements, within the scheme would be all those countries of Western Europe the defence of which is necessary for the defence of the two Principals. Points of common strategy would be decided by a council elected from among all the participants. The Union would be within the framework of the United Nations. It would not be exclusive, but would be open to any country west of a line running through Koenigsberg and Venice. Countries farther east which are prepared to honour the agreement should not be debarred. Eventually Germany herself should be admitted.

Regional Agreement between the Western European Powers, Canada and the Pan-American Peoples

Mr. Walter Lippman, in a study of American foreign policy, has referred to the Atlantic Community and this conception is developed, from the British point of view, by Sir Edward Grigg in his book, " British Foreign Policy."

It is pointed out that in this air age, Western Europe, the North-west shoulder of Africa, the Atlantic Islands and the eastern face of the American Continent, all form one strategic area. Furthermore, the peoples of this area share a homogeneity which distinguishes them from the rest of the world. "The whole family of peoples," says Sir Edward Grigg, " deriving from Western Civilization in all parts of the world totals just short of 400 millions, of which 385 millions are in the Atlantic area. The Atlantic Community, therefore, *is* Western Civilization. It has made the world today what it is; and it will be the principal force in making the world of tomorrow whatever it may become."

There is a community of interest between the nations forming this block. It is a natural development of history and tradition. Conditions are, therefore, ideal for the contraction of alliances between the nations forming this area, which will be more than mere pieces of paper—treaties which will embody the community of interest of the contracting parties and cement friendships which already exist and are natural and traditional to the States concerned.

The immense power, political, military and economic, of the U.S.A. would render her the keystone of such a system. In any future major war fought on European soil, America must necessarily be the arsenal, just as Great Britain will be the advance base, and France and the Low Countries the bridgehead of the Western democratic powers. The first priority of British diplomacy, therefore, must be to maintain the closest possible relations with the U.S.A.

Whatever the future may hold, a policy based on the essential unity of the nations of the Atlantic Community must offer the greatest hopes for the democratic way of life. If war is forced upon the world—and the only war one can imagine would be between Russia and an Anglo-American combination—then the prior formation of a Western Alliance is a logical anticipation of a state of affairs which will happen any way.

Extra-European Nations and their Interests in Europe

Of the extra-European peoples the most important, the British Commonwealth of Nations, has both its origin and headquarters in Great Britain, and thereby derives a direct interest in European politics. In times of crisis, it acts with a unanimity which is surprising in view of the independence and separation of its members. It is immensely powerful and, taken as a whole, may compare with Russia or the United States. Great Britain might choose to rely upon the close ties that exist between herself and the Dominions for her security and for support for her decisions in the settlement of Europe; but, unique and powerful though the British Commonwealth may be, any attempt by Britain to retire within it to the exclusion of other arrangements would make the other nations of Western Europe feel that they were being left to their fate. As we have seen, they all look to Britain for leadership. Without her aid and encouragement, they would soon become new puppets of Russia. This would result in a weakening of Britain's position in Europe and consequently a weakening of the Commonwealth itself. As a world-wide association, the British

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Commonwealth cannot take the place of a regional defence organization for Western Europe.

The peoples of the United States of America sprang mostly from European stock; but, traditionally, the U.S.A. has always recoiled from "foreign entanglements." She has relaxed this maxim of recent years as a result of a more positive interpretation of the Monroe Doctrine, to become the protagonist of Pan-American collaboration. More recently, as the most powerful of the Western Allies, she has emerged as the acknowledged leader of Western Democracy. On her soil the United Nations meet, by her bounty the starving peoples of Europe live. She could not withdraw now, even if she wished, from European politics. Nevertheless, because of the traditional isolationism and mistrust of European nations, it would be unwise to rely on America's support of any one group of European powers against another, unless America's own security is threatened. Although much has been written to support the claim, neither the integrity of the British Commonwealth nor the security of Great Britain forms a discernible part of America's political creed.

"World Society is Ill"

World society is ill. We are living through what is perhaps the greatest revolution in the history of man, though many are quite unconscious of the fact. We are living in an age of transition from *laissez-faire* to a planned society, and the arrival of the atomic bomb has accelerated the rate of change to an almost unbearable extent.

We are living in a world of nation-states, whose governments tend to look upon economic, social and political problems as *national* problems. No matter to what country we belong, the centre of our political universe is our own nation. Our own particular nation is the immovable point around which all problems and events outside the nation are considered to rotate.

The Real Issue

The conflict between our static inherited political institutions and the realities of economic and social forces is the real issue before us and not, as is generally supposed to be the case, the confused hatreds and suspicions of opposing ideologies and creeds.

"Man is not a Reasonable Creature"

Unfortunately, man is not a reasonable creature. He has reached widely differing levels of political and cultural development in different countries. His aims and motives are infinitely variable. The real powers of evolution have always been, and are today more than ever, based on irrational notions, tribal instincts, faith, fear, hatred and superstition.

"Peace is Order Based on Law"

Man can only become a constructive social being if society imposes upon him certain principles in the form of legal order. History demonstrates that there is only one method to make men accept moral principles and standards of social conduct. That method is Law.

Peace is order based on law. Trying to solve present-day international problems by the old diplomacy or conventional foreign policy, through alliances or the Balance of Power is like attempting to cure cancer with aspirin. We must delegate part of our national sovereignty to bodies capable of creating and applying law in international relations. We must establish constitutional law in world affairs, and universal law must be created in conformity with the democratic process by freely elected and responsible representatives.

What is a Treaty?

A treaty is the ratification by the contracting parties of mutual interests *which already exist.* Treaties can be effective only if they fulfil this requirement. Treaties between antipathetic States cannot last. Perhaps the greatest problem of today is whether Soviet Russia and Great Britain have common interests enough to make treaties between them effective.

Tendencies to Totalitarianism

Today we are confronted with the paradox that almost all industrial nations, both capitalist and communist, are assuming the form of the all-powerful Nation-State, in almost total contradiction to their proclaimed principles. It would seem, therefore, that capitalism and socialism are parallel phenomena, expressions of one and the same era; that communism does not grow out of capitalism; and that within the existing nation-state structure, both have tendencies at the present time to develop into centralized bureaucratic and totalitarian régimes.

To what purpose then is all this mistrust, hatred and fighting between socialists and capitalists accusing each other of totalitarianism, oppression and exploitation? The truth is that both are becoming tarred with the same totali-

IMPORTANT—See under WANTED, page 68.

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tarian brush; and it is high time we realized this fact and started the fight for human liberty and welfare against the real enemy—the nation-state.

A World Republic

After the San Francisco Conference, President Truman is reported to have said:

"It will be just as easy for nations to get along in a republic of the world as it is for America to get along in the republic of the United States. Now when Kansas and Colorado have a quarrel over the water in the Arkansas river, they don't call out the National Guard in each State and go to war over it. They bring a suit in the Supreme Court of the United States and abide by the decision. There isn't a reason in the world why we cannot do that internationally." These were historic words: a sign-post to the future far beyond San Francisco, and the key to world harmony.

The Economic (?) Causes of War

It was fashionable at one time to find an economic cause for every war. If this explanation were valid we could look forward to a long period of assured peace; because, of the three powers capable of conducting a world war, all can be described as economically satisfied. Unfortunately, it is painfully clear that the economic explanation for war cannot be valid. It is also clear that upon Russia and the relations between Russia and Great Britain and the U.S.A. depends world peace. For that reason the foreign policy of the U.S.S.R. must be particularly studied, because on an accurate understanding of it depends the correctness of the policies of Britain and the U.S.A.

Britain's Destiny as a Leader in Political Institutions

With our tremendously rich heritage of some 800 years' experience of government, it is possible that it may be our destiny to lead the sovereign powers into a federation of peace-loving nations open to all and directed against none.

President Roosevelt and the Science of Human Relationship

In his last address, which he did not live to speak, President Roosevelt wrote the following words, which are his political testament: "We are faced with the pre-eminent fact that, if civilization is to survive, we must cultivate the science of human relationship, the ability of peoples of all kinds to live together and work together in the same world at peace."

The Help of Propaganda and Publicity

With modern methods of propaganda at our disposal — mass-circulation newspapers, films and radio — skilfully presented by experienced publicity experts, it is not unreasonable to hope that, within a comparatively short time, the peoples of the world will come to realize and believe in the fundamental principles of universal law, and demand their translation into positive world institutions.

The Draft Peace Treaties

I.—ITALY

Naval, Military, and Air Clauses

Under Part IV of the Treaty Italy is required to reduce her Navy to a total of 22,500 men, her Army to 250,000 (including Carabinieri) and her Air Force to 25,000; she is allowed to retain two battleships, four cruisers, and various smaller craft, up to 200 medium and heavy tanks, and no submarines or bombing aircraft. She is also forbidden to construct or acquire any battleship, aircraft carrier, submarine, or assault craft. Extensive areas in Sardinia, Sicily, Apulia, and the frontier areas with France and Yugoslavia are to be wholly or partially demilitarized, as are the Pelagian Islands and Pantellaria.

II.—THE BALKAN SATELLITE STATES AND FINLAND

The military forces of the four States are reduced to the following levels:

	Rumania	*Hungary*	*Bulgaria*	*Finland*
Army	120,000	65,000	55,000	34,400
Anti-aircraft forces	5,000	(1)	1,800	(1)
Navy (personnel)	5,000	Nil (2)	3,500	4,500
(tonnage)	15,000	Nil	7,250	10,000
Air Forces				
(personnel)	8,000	5,000	5,200	3,000
(aircraft)	150	90	90	90

As in the Italian treaty, the possession of bombing aircraft is forbidden, and the types of naval craft permitted are restricted, though no agreement could be reached on the right of Bulgaria to possess motor torpedo boats. Restrictions on the construction or acquisition of certain types of equipment are analogous to those in the Italian treaty. Provisions for the withdrawal of Allied troops within ninety days of the coming into force of the respective treaties, and for the disposal of Allied and enemy military equipment, are identical.

[1] Included in overall figure.
[2] River flotilla personnel are included under Army.

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Naval Force and Aviation Force

By Group Captain D. R. Evans
C.B.E., D.F.C.

[The figures in the text refer to the appendix, which is a summary of authors and authorities quoted.]

Powers and Forces

Sea Power

IN defining sea power, Admiral Nimitz[1] writes of " those plodding burden bearers that bring to our shores the tin and manganese from overseas; yes, and the pepper and bananas and and coffee of your table needs," and were he an Englishman he would speak of more fundamental foods than pepper and bananas. This is a sound approach to the subject of sea power and it is reminiscent of the Quennells'[2] books on the feeding, housing and clothing of generations of Englishmen, which are the best introduction to English history. These are the essentials of life; and the fighting forces are only the instruments for safeguarding them.

But as these fighting forces are the subject of this study it is necessary to consider definitions of sea power that are at once more specific and more comprehensive, in order that the role of fighting forces in the total make-up of sea power may be correctly appreciated. Before the days of Mahan, sea power referred to a "Power or Nation that had a considerable navy—in contradistinction to a military Power which was a State having a considerable army, but only a relatively small navy."[3] Mahan introduced the modern idea of sea power, which refers not to a State but to an intangible asset possessed by a State. The latest encyclopædia[4] describes it as " the influence a nation can exert to secure its rights and uphold its interests on the seas and oceans of the world, both in peace and war," and says it includes " the ability to deny free use of the sea to an enemy." Admiral Nimitz refers not only to " the plodding burden bearers " but to combatant ships and aircraft, amphibious forces, port facilities, bases, factories, farms and the functioning organization behind sea power. Amongst other things he calls sea power a force and a science.

Bernard Brodie[4] describes sea power as the ability to control seaborne transportation over the seas, and John P. Cranwell,[4] after saying that sea power is a doctrine or a theory, summarizes it as the ability to maintain by force an even, uninterrupted trade over the seas, and to deny that ability to the enemy. It will be seen that both these modern Americans bring out the idea that sea power is the " ability " to send ships across the sea. This is the essence of the matter, for it implies the successful application of all the elements of sea power. Sea power is not only the ships themselves.

The main elements of the sea power of a nation are the merchant shipping and trading ports, the fighting forces that control the sea lanes and their bases, and the civil power that supports them all. Until the coming of the aircraft, the fighting component of sea power consisted almost entirely of ships, together with the army that secured their bases. Hence the deep-rooted tendency to regard sea power not only as synonymous with the fighting force behind it, but with fighting ships in particular. Experience of warfare in the past thirty years has made it clear that the fighting component of sea power consists not of fighting ships alone. It is a three-pronged weapon including also fighting aircraft and armies. And to avoid any confusion with the intangible asset of sea power, the expression " power " will be avoided in this context and this trinity of fighting force will be described by the names Naval Force, Aviation Force and Land Force. It is with the first two of these fighting forces that this paper is concerned.

Air Power

"Air Power," says General Arnold,[7] " includes a nation's ability to deliver cargo, people, destructive missiles and war-making potential through the air to a desired destination to accomplish a desired purpose. . . . Air Power is not composed alone of the war-making components of aviation." This does not define air power but it serves to bring out the two points similarly stressed in the case of sea power. Air power is the " ability " to send aircraft through the air in the same way that sea power is the " ability " to send ships across the sea. And the war-making components of aviation are no more air power than are the war-making components of shipping sea power. J. C. Cooper[4] defines air power as " the ability of a nation to act through the air space, in other words, to use controlled flight—

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such, for instance, as the flight of aircraft." This is admirable.

The elements of air power are similar to the elements of sea power. They are the civil air fleets and trading airfields, the fighting forces that control the skies together with their bases, and the civil power supporting the whole. And similarly, the fighting force of air power consists not of fighting aircraft alone. It is again a three-pronged weapon including also fighting ships and armies. It is noteworthy, for example, that locally, air power can be denied to the enemy solely by Land Force using light flak. It is important to realize this in order not to be surprised if in the future Aviation Force loses some of its importance in the make-up of air power, in the same way that the importance of Naval Force in the make-up of sea power has decreased. General Arnold appears to regard "Military Air Power" and "Air Force" as synonymous, and by so doing, tends to exclude the Naval Force and Land Force components of the fighting force behind air power. The error is today perhaps not so easy to see as the error in regarding "Military Sea Power" and "Naval Force" as synonymous—a fallacy at once apparent to an airman.

The Problem

To summarize the foregoing in its simplest terms, sea power is the ability to send ships across the seas, and air power is the ability to send aircraft through the air. In both cases, the nation possessing the power must be capable of maintaining it, both in peace and war, and if necessary of denying it to an enemy. Naval Force and Aviation Force are two of the weapons in the national armoury which may be applied on behalf of Sea Power or Air Power or Land Power. The intention of this paper is to study the relative value of Naval Force and Aviation Force to the security of the British Empire, and to estimate to what extent Aviation Force is likely eventually to supplant Naval Force. The study will be in two phases, clearly separated. The first and longer part will argue on the basis of conditions obtaining at the outbreak of a major war, should one occur in the next ten years or so. This will be called the Present Phase. The second part will indicate the changes that may have taken place by the beginning of the next century.

Present Phase

General Effects of Weapon Development

It would now be logical to attempt a reasoned dissertation on the probable development of individual weapons during the next decade, in order that their effect on Naval Force and Aviation Force could be the more convincingly set forth. Of this the writer is incapable; nor is there space. Instead, and as the only alternative, it is necessary to list the premises as regards weapon development on which the later arguments are based. On the outbreak of a major war starting in the next ten years it is assumed therefore:

(*a*) That the British Empire and her opponents have atomic bombs, but that nuclear warfare is still so expensive in national effort that only specially selected targets will be attacked with this weapon; and that for accuracy the bombs will be delivered from aircraft.

(*b*) That ground-launched long-range rockets of limited accuracy (1 mile in 100) are available to both sides.

(*c*) That A.A. guided missiles have not yet replaced radar controlled fighters as the primary defence against attacking aircraft.

(*d*) That A.A. guided missiles are still incapable of intercepting long-range rockets.

(*e*) That in consequence of (*c*) and (*d*) above, aircraft are difficult to intercept at high speeds, and that the interception of long-range rockets is still impossible.

It may be concluded from the foregoing that atomic bombing by high-speed aircraft is the most dangerous form of attack in the period under review.

What is the general effect of limited nuclear warfare on Naval Force and Aviation Force during this present phase? The need for air superiority and reconnaissance will be no less vital than in the past. The British Empire will still need its merchant shipping, if only because commercial air fleets will not yet exist to replace it, and this shipping will need protection from other weapons than atomic bombs. Armies will still be carried in ships when they cannot be carried in aircraft, and they will still require at least the promise of tactical air support. Thus, it seems unlikely that the general structure of the fighting forces will be greatly altered, but three major effects are clear.

First, the necessity for dispersion will be paramount. A target of first-class importance for its morale, industrial or fighting value will be an atomic bomb target. Therefore, industry, bases and actual fighting units must be dispersed, and the smaller and more powerful the fighting units the better.

IMPORTANT—See under WANTED, page 68.

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Secondly, if the British Empire is involved in a new war, the atomic weapon will not necessarily mean that it is a short war. Great Britain may be indefensible, but the Empire as a whole has the ability to disperse to a degree at least as great as any potential enemy. Thus the ships and aircraft providing communication between the parts of the Empire will be as important as ever in the past, while economy of effort will be vital.

And thirdly, the difficulties of air interception and the damage sustained through failure to intercept will be so great that the immediate adoption of the offensive may be vital to success; and other things being equal a force immediately capable of strategically offensive action will be a more valuable force than one which is not.

General Characteristics of Naval Force and Aviation Force

Aviation Force has greater scope than Naval Force. In general, Naval Force can exercise pressure only by the control of sea communications, and even in that field help is required from Aviation Force. Moreover, the new enemy may not be sensitive to maritime pressure. Aviation Force can attack any objective on land, sea or in the air. Only if half the people in the world lived at the bottom of the sea could Naval Force have similar scope.

Aviation Force can launch an offensive without delay and with tremendous striking power. The striking power of Naval Force is inferior and develops more slowly, even when the enemy is sensitive to that particular form of attack. The ability of Naval Force to disperse and concentrate at will has always been noteworthy. This flexibility was demonstrated in many campaigns; it was the envy of the soldiers and it spelt economy of effort. Yet Aviation Force, owing to the high speed and small size of its fighting units and to its independence of surface obstacles, possesses a flexibility that makes it capable of greater dispersion, more speedy concentration and hence of greater economy. And to the Empire, economy of effort is of first importance.

Naval Force and Aviation Force are wholly dependent on bases. Aviation bases are smaller and less vulnerable than naval bases. This, coupled with its superior flexibility and the small size of its fighting units, renders Aviation Force as a whole less vulnerable than Naval Force to the atomic weapon; although individually and in the open, as Brodie observes (without the qualification) the aeroplane is " a military anomaly in that it can hurl the most elephantine of projectiles and yet be mortally stung by a pebble."

So much for the general characteristics of the two Forces. For the purpose of a closer analysis, the modern conception of total war will be broken down into air, sea and land warfare and the relative importance of Naval Force and Aviation Force as components of Air, Sea and Land Power will be studied in turn. Finally, their impact on the total Civil Power of the enemy will be considered.

As Components of Air Power

When aircraft bomb naval bases, tank concentrations and airfields, Aviation Force acts in turn as a component of Sea Power, Land Power and Air Power; although, as Aviation Force is so closely and fundamentally a part of Air Power, all three operations are normally considered as manifestations of Air Power—a conception which in an analysis of this sort is bound to confuse. This section, therefore, deals only with the air war, that is, the battles for " the ability to use controlled flight." In the present phase this responsibility will continue to rest mainly on Aviation Force which will achieve air superiority by both offensive and defensive action. Bombers will remain the principal offensive weapon, sometimes carrying atomic bombs, and they will attack the enemy's aviation potential from the raw material to the completed aircraft. Fighters will remain the principal defensive weapon, though they will be gradually giving way to ground launched A.A. guided missiles.

What is the role of Naval Force as a fighting component of Air Power? Naval Force can only dispute control of the air directly by endeavouring to obtain air superiority over fleets and bases with A.A. gunfire. It will be agreed that this direct contribution to Air Power is small, and in the past its value has to some extent been offset by the fact that the air space thus denied to the enemy has often been denied also to our own aircraft.

Indirectly, however, Naval Force will continue during the present phase to contribute materially to the Air Power of the Empire. First, and in co-operation with Aviation Force it will, by controlling the sea communications of the Empire, permit the sea transportation of the raw materials for aircraft construction, of oil, and of general supplies to air bases. In a long war this is a most important function for Naval Force and will remain so throughout the present phase of limited air transportation. The converse, of denying these same facilities to a continental enemy may not be so important. Secondly, by the provision of protected floating airfields it will enable Aviation

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Force to fight the air war in areas beyond the effective range of shore-based aircraft. The provision of carriers for the use of close fighter escorts will be necessary, because far out at sea, or on the longer legs of the Empire's sea communications, the use of standing patrols by long-range fighters will be uneconomical, even when technically possible. The air war may also be fought by carrier-based aircraft attacks on enemy airfields and carriers, and even on his aircraft industry. In brief then, Aviation Force will remain the primary fighting force behind Air Power but Naval Force will continue to make a substantial contribution by helping to protect the seaborne transportation of aviation potential and by the provision of mobile airfield services.

As Components of Sea Power

An essential prerequisite for the exercise of Sea Power in war is the maintenance of air superiority in the area in question, and it has been shown that this is primarily the responsibility of Aviation Force supported by Naval Force. For the purposes of argument it will be assumed then that our own ships and aircraft are able to operate without serious hindrance from enemy aircraft, and it is the intention now to study the relative contribution of Naval Force and Aviation Force to Sea Power when this state of affairs exists. There remains the age-old problem of preventing enemy ships from interfering with our seaborne communications, and of destroying or neutralizing his.

There are three vulnerable points in the Sea Power of a nation; they are the shipping industry, the bases and harbours, and the ships at sea. The shipping industry may be attacked by the slow strangulation of sea blockade exercised by Naval Force and Aviation Force together, or by the more effective direct attack by Aviation Force. The bases and harbours may be attacked by Naval Force with underwater weapons or bombardment, but again, the greater damage is likely to be inflicted by Aviation Force. Thus Aviation Force will play the more important role in the attack of these two vital elements of Sea Power—attacks which, it must be emphasized, will be decisive against countries like Great Britain, unless the most drastic dispersion is effected before the next war starts.

To estimate whether Aviation Force or Naval Force will play the major role in the attack and protection of ships at sea is more complicated, and is best approached by considering in turn six major weapons available for this attack. These are shore based and shipborne aircraft (excluding minelayers), major surface ships with guns and torpedoes, submarines, mines, and miscellaneous vessels.

Of carriers, Admiral Nimitz writes: "The carrier is still the Queen of the Seas. And Her Majesty must have a bodyguard of fast battleships, modern cruisers, long-range destroyers, submarines and a network of auxiliaries." He says, too, that: "A carrier task force is a team of high-speed, mobile airfields delivering fighter planes, dive bombers and torpedo bombers to the chosen battlefield, be it on sea or land." It seems reasonable to conclude from these two statements that it is really the "fighter planes, dive bombers and torpedo bombers" that are the Queens of the Seas, for it would be a sorry domain that could be ruled by a mobile airfield. The striking force in this case is Aviation Force, with Naval Force providing the services. (Similarly an airborne division is essentially a unit of Land Force, commanded by a general, although it travels to the battlefield by air. Nor are expeditionary forces units of Naval Force because they are embarked in transports.) On this American estimate, therefore, Aviation Force emerges as the primary striking force in war at sea, and this is confirmed by the peacetime composition of the U.S. Navy—thirteen carriers, thirteen escort carriers and four battleships. It is possible, however, that for some years major warships will be the primary weapons on those occasions when operations are essential under really bad flying conditions; and they will, therefore, have at times a more positive role than that of Queen's pawn. Offensive aircraft will not be operated from carriers unless they lack the range to operate in the required area from a shore base. Carriers are expensive and vulnerable; and aircraft do not carry the greatest bomb loads at the highest speeds for the greatest distances if they have to fly off and land on unstable two-hundred-yard runways. As ranges increase, shore-based offensive aircraft will gradually replace carrier-borne aircraft, and in this role Aviation Force will no longer require Naval Force to provide mobile airfields on the present scale. On the Empire routes it should be possible to advance to this stage earlier than in the wide spaces of the Pacific, with which the Americans have been so largely concerned.

Operating thousands of miles from their bases, submarines were credited with almost two-thirds of the total tonnage of Japanese merchant marine losses in the last war; and of the total Japanese naval vessels lost, submarines sank one third.' Since then the future of submarines has been improved by the promise of a marked increase

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in submerged speed, by the introduction of the Schnorkel and by the possibility of being able to cruise for moderate ranges without taking in air at all. Moreover, being small craft suitable for dispersion and protection, they have fair prospects of avoiding damage from the atomic bombing of bases. Submarines are therefore likely to be essential partners with aircraft in torpedo attacks, and in long-range reconnaissance. In anti-submarine operations of the last war, aircraft were responsible for 369 of the 781 U-boats sunk and, in conjunction with ships, for a further 46. Of the 215 Japanese and Italian submarines sunk, aircraft were responsible for 28.[10] On these figures, which show an interesting discrepancy between theatres, Naval Force obtained greater direct results than Aviation Force, but the considerable indirect effect of aircraft in keeping submarines submerged over wide areas can hardly be measured. In the future, the difficulties that will be experienced on the one hand by ships in tracking submarines at 20 knots and more; and on the other by aircraft in finding submarines that are capable of operating for long periods submerged, make the relative importance of Naval Force and Aviation Force in this role hard to assess. Certainly both will be required.

In the last war it was Aviation Force that was responsible for five-sevenths of the very effective British offensive minelaying effort, and the aircraft's advantages of speed and flexibility make it improbable that surface ships will lay mines offensively again on any scale. On the other hand, owing to their large capacity, and as there is no requirement for speed, ships are likely to lay the defensive mines. Neither is there any sign that the mine-sweeping role of Naval Force will decrease in importance.

There remain a number of smaller weapons and essential ancillaries that are components of Naval Force and that have not been considered. There are the fleet trains, that will gain in importance with the threat of atomic attack on static bases and refuelling ports; escort and inspection vessels that have relations with merchant ships more intimate than aircraft can achieve; and the light coastal forces that will complement aircraft and submarines in attacks on the enemy's ships.

This comparison of Naval Force and Aviation Force as instruments of sea power shows that, even when air superiority has already been achieved, Aviation Force is the main striking force of wartime sea power, whether it is directed against the shipping industry, the ports and bases, or the ships at sea. But it is clear that Naval Force is essential both to complement Aviation Force, and to perform those many duties of which Aviation Force is incapable.

As Components of Land Power

Taking a lead from the definitions of Air Power and Sea Power, it is possible to define Land Power as a nation's ability to enter an enemy country, control his administration and force him to comply with the national policy. In the final reckoning, wars are only won on the ground, for that is where the human race lives, and the final act of winning is the occupation of the enemy country by Land Force. The object of this section is to compare the contributions made by Aviation Force and Naval Force to Land Power on these occasions when the defeat of the enemy Land Force in battle is necessary. To the Empire, superiority in the skies and on the seas is clearly a prerequisite, and for that reason the establishment and maintenance of Air Power and Sea Power have been considered first. But what support can be given to fighting Land Force by Naval Force and Aviation Force other than by obtaining command of the seas and the skies? Clearly the industry behind Land Force is as vulnerable as the industries behind Aviation Force and Naval Force already considered; and similarly Aviation Force will play the leading part in its dissolution, supported by the slower strangulation of sea blockade, conducted by Aviation Force and Naval Force in partnership.

That is indirect support; so, too, is the carriage of Land Force in fighting ships and military aircraft. As regards direct support, Admiral Nimitz writes that the American fleet in the last war was not solely engaged in fighting enemy fleets and he refers to the U.S. Navy's three months' intensive operations off Okinawa, "fighting an island." Similarly, the Royal Navy's successful coastal and river bombardments in the Mediterranean and in North-West Europe were indeed direct support of Land Force (although some operations, such as those off Genoa and in the Adriatic, were strategic bombardments of the type now generally associated with Aviation Force and directed against the Civil Power of the enemy).

As regards the direct contribution of Aviation Force to fighting Land Force, it is unnecessary to stress the tremendous direct support given by the Empire's Aviation Force in the Far East, the Mediterranean and North-West Europe. It is enough to say that relatively it was far greater than that given by Naval Force and if, in the next ten years, land fighting is again necessary, there is no reason to believe the situation will be altered.

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Versus Civil Power

It will have been noted that the relative contributions of Naval Force and Aviation Force to the destruction of the industries behind Air Power, Naval Power and fighting Land Force have been compared. And it is clear that the direct attack of these industries by Aviation Force (armed on occasions with atomic bombs) is certain to be more effective than a sea blockade, conducted by both Aviation Force and Naval Force.

It remains to stress the tremendous role of Aviation Force when employed against the whole Civil Power of the enemy. The devastation of the Japanese cities by the American Twentieth Air Force produced moral and material effects that finished the war. Aviation Force was not acting at this stage in support of Allied Land Force, for the armies were not called on to attack Japan. It was not acting in support of Allied Sea or Air Power for we had already attained the necessary superiority in both elements—we already had the ability to send ships across the sea and aircraft through the air to deliver their loads, and we had to a large degree denied this ability to the enemy. Aviation Force acted directly and decisively against the Civil Power of the enemy. And few would say that some day this will not happen again.

XXI Century

Before summarizing the relative value of Aviation Force and Naval Force, it would be wrong not to attempt a forecast of the conditions of warfare as they may be in the next century, by which time a radical change is likely to have occurred.

Nuclear warfare will be within the means of all the bigger Powers, and under this threat the general dispersion of targets, forecast earlier, will have been achieved to a considerable degree. The British Empire will consist of a string of primary bases, stocked with compressed food, and each capable of producing and operating the weapons of war, and thus of continuing a war when one of its fellow members is devastated. Each potential enemy will be within range of nuclear bombardment from two or more of our primary bases. If the Empire is developed in this way, it will have a power of dispersion and an ability to concentrate against an opponent unsurpassed by any Power known today.

The air will be the primary medium for the delivery of explosives, bacteriological attack, occupying armies and trade (although at the outbreak of war, nuclear explosives may be delivered in crates and suitcases by agents). The aerial vehicles, being small, will be capable of protection from nuclear attack when on the ground, and their high speed and the vast extent of their medium will give them a degree of immunity when in the air. In contrast, ships, with their comparative immobility, their size and the vulnerability of their less numerous bases, will have become a secondary means of transportation and weapons of limited application. Thus, the "ability of a nation to act through the air space, in other words, to use controlled flight—such, for instance, as the flight of aircraft"—will be paramount. Air Power, in fact, will be supreme.

But will Aviation Force be supreme? If some of the aerial vehicles referred to are not aircraft but rockets, are they Aviation Force? It is contended that objects which are controllable as they pass through the air belong essentially to Aviation Force; and although a controlled rocket may little resemble the Avis, both are controllable in the same medium and both subject to the laws of aerodynamics. And long-range rockets will have to be controlled if they are to be accurate and economical. Conversely, uncontrolled rockets must be regarded as shells, for they differ from shells only in the method of propulsion. The chief defence against both long-range rockets and aircraft will be guided or homing A.A. missiles (in fact, short-range controlled rockets) used in conjunction with counter-measures against the enemy control systems. Thus the primary weapons for both attack and defence will be a part of Aviation Force.

This growth of Aviation Force to a stage when it is without doubt the primary weapon in the national armoury, does not mean that it will be operated by one fighting Service or even by one branch of a unified Service. Its very ubiquity makes this unlikely, for to take the two most appropriate examples, it is clear that in practice, what fighting ships remain will operate their own A.A. guided missiles, as today they operate fighters and A.A. guns. So, too, there will be occasions when ships will launch controlled offensive rockets for the bombardment of enemy ships and countries—bombardments carried out, perhaps, from long-range submarines. However, with the essential world trade carried by air, and inter-continental air bombardment a normal method of warfare, the scope of Naval Force, even as platforms for launching Aviation Force, must be limited.

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SUMMARY

Both Sea Power and Air Power are still essential national assets, backed by the three-pronged instrument of Aviation Force, Naval Force and Land Force. Naval Force is not synonymous with Sea Power, nor is Aviation Force synonymous with Air Power; in fact, the "Force" may not even be the primary weapon behind its associated "Power."

In general characteristics, Aviation Force has today the advantage of Naval Force. Aviation Force has greater scope than Naval Force; indeed, the enemy may not even be susceptible to maritime pressure. Aviation Force has greater striking power. It has a flexibility and mobility that permits greater concentration and greater economy. Furthermore, its powers of dispersion render it less vulnerable, particularly in nuclear warfare.

In attaining air superiority, Aviation Force has a bigger role than Naval Force. For obtaining and holding command of the sea, Aviation Force has become the main striking force of Sea Power, whether it is against the enemy's shipping industry and bases or against his ships on the seas. As a complement to the striking power of Aviation Force and for other duties of which Aviation Force is incapable, Naval Force remains an essential instrument of Sea Power. Aviation Force can support fighting Land Force more effectively than can Naval Force. And more important than all these, Aviation Force can act directly, and more decisively than Naval Force, against the total Civil Power of the enemy. Aviation Force has then today a value greater than Naval Force for maintaining the security of the British Empire, and has gone far to replace it.

Nuclear warfare has made dispersion of targets an immediate necessity, a requirement emphasized also by the difficulties of air interception at high speed. If they are to exist, fighting units must be small and operated from a multiplicity of bases. Nevertheless, it seems that the general structure and relative importance of Aviation Force and Naval Force are unlikely to change fundamentally until aircraft replace ships as the primary means of long-distance transportation. Then Sea Power will at last lose its importance and Air Power will be supreme. And at that time the scope of Naval Force will again diminish to a considerable extent, and the value of the remaining fighting ships will lie primarily in their use as floating platforms from which Aviation Force will operate in the form of controlled rockets.

CONCLUSION

To analyse the future relative value of Aviation Force and Naval Force is not easy, and of necessity the analysis rests on a number of improved premises. Following the example of successful war leaders, it is easier and more profitable to synthesize the forces of a nation at war, stress their interdependence and conclude that unity is strength. But there is value in the analysis. It demonstrates the essential difference between Sea Power and Air Power on the one hand and the fighting instruments or Forces on the other. They are too frequently confused. It is the knowledge that the present R.A.F. is as much an instrument or Force behind Sea Power that leads to the realization that for the purposes of analysis, the Forces must be separated from what appear to be their parent Powers. Yet the study is not entirely academic, for it shows that if the Empire is to maintain its influence — and for moral reasons it is vital it should—nothing is more important than the development of its Aviation Force and Civil Air Fleet.

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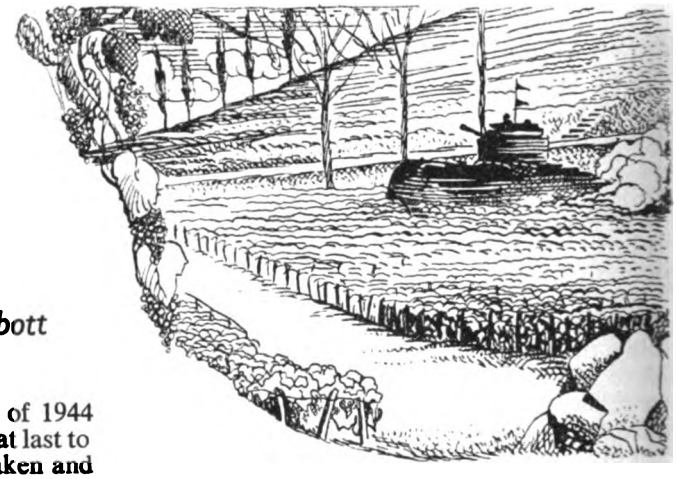
The CHAMPAGNE WAR



By Squadron Leader R. A. Abbott

AS August merged into September of 1944 the dawn of Allied victory seemed at last to be approaching. Paris had been taken and the Anglo-American armies were pushing on to Belgium, Holland and the German frontier. The Russians were threatening East Prussia. Our expectations turned out to have been somewhat premature, but there was at the time good reason for optimism, and hopes ran high. Even London, pounded by Hitler's "V1" could find things easier to bear.

Overshadowed as it was by events in the north, there was another Allied army operating in France. It had penetrated to the area around Lyons, and it had been in France since 15th August, the day on which it landed along the Riviera coast. This Southern French campaign deserves to be remembered by us, and by our American friends. Its value will almost certainly long be debated by historians and military strategists.

On 11th August the world was told that Mr. Churchill had arrived in Italy, and the world at large wondered why. Had the old man just gone to look at Rome, to look at the front line up around Florence? Or was something more important in the offing?

There was little speculation among us who were in Italy or Corsica at the time. Huge convoys were ready and waiting in the Bay of Naples, whole divisions had been withdrawn from the Allied forces in Italy, the eastern side of Corsica had sprouted with new aerodromes, and they were crowded with aircraft, the crews alerted and ready. It was to be Southern France this time, and the odds were that the old man would insist on being in on this D Day, the second within little more than two months.

We have since been told that Mr. Churchill was against the whole idea of the Southern France expedition, that he thought it would be useless in itself, and would seriously weaken the force of our Italian campaign. We know that Field-Marshal Alexander and Field-Marshal Maitland-Wilson were against it, but that General Eisenhower was for it, and that the American view prevailed, as it so often did. All this wasn't a difficult guess at the time, but it could only be a guess, and no one could know in advance whether the project would justify itself or not. In the event it proved to be an operational " walk-over," but strategically probably a wasted effort. The American forces' newspaper " Stars and Stripes" soon passed its own verdict, called it "The Champagne War." It was a good description for a time, but the bubble finally burst in the Belfort Gap, while the heady draught lost its savour before then, in the abortive effort to cross into Italy from Mentone.

What happened in the actual invasion? As in the Normandy operation, the Royal Navy took the leading role at sea, but here the landing troops were overwhelmingly American. The R.A.F. was overshadowed in numbers by the U.S. Air Forces.

The initial landings on Tuesday, 15th August, took place in the area between Toulon and Cannes, and in the words of Allied Force Headquarters "by midmorning all landings were proceeding successfully according to schedule against only light ground opposition and no air opposition. Airborne operations were also successfully executed."

What had Mr. Churchill been doing? The British forces' newspaper "Union Jack" reported on 16th August that "he was at embarkation centres giving a cheering word to Allied troops making ready for D Day, and was conferring with Allied leaders on details of the operation. When the men embarked, the Prime Minister was there giving the familiar 'V' sign as he moved up and down among the convoys. He looked fit and seemed to be thoroughly enjoying himself." Whatever his private feelings, then, he was determined to make the best of it.

Once firmly established ashore, the troops under command of the American General Devers

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spent much of their time trying to find the Germans. The enemy commander had little more than one division of front-line troops at his disposal, and he decided not to throw them away. He fought only rearguard actions, while his main body made all the speed it could, retreating up the Rhone valley towards Dijon and Nancy.

On 21st August the Allied troops took Toulon, and two days later the key port of Marseilles fell into our hands. It was all over on the Southern French coast almost to the Italian frontier, and within a further four days the Americans were reported in Montélimar, more than 100 miles north of the original landing points. It had taken less than two weeks, the chase was on and it continued to be a chase, our armies doing the chasing. At the same time the support and supply formations had all their work cut out to keep up with our front-line elements, and there was little time for anyone to relax in the rich green landscape of the Rhone valley, to bask in the sunshine, or to linger and enjoy much of the heartfelt gratitude of the French population.

As much as forward troops can ever enjoy themselves these troops did, and the gay atmosphere was soon reflected in the forces' newspapers, notably in the brilliant cartoons of the American Bill Mauldin.

Young Corporal Mauldin had, intentionally or otherwise, trodden on the corns of many a high-ranking officer because of his biting and bitter cartoons during the earlier campaigns in Sicily and Italy. One of his most bitter efforts eventually won him a Pulitzer Prize in the States, but when originally published it was regarded in a very different light by some American generals. Another earned him a personal rebuke from General Patton, a rebuke which nevertheless didn't persuade him to change his style.

None of Mauldin's cartoons from Southern France was bitter, and the one which always seemed to me to express most perfectly the general lightheartedness of September, 1944, showed an American Transport Officer addressing his convoy-drivers somewhere in the forward area. He was saying: "Some of you may not come back. A French convoy has been reported on the road."

Anyone who has ever driven in France could hardly fail to appreciate that sly dig, and anyone who was in Southern France at that time will recall the bright interlude in a generally dreary war, an interlude so memorable for those who had come from the long-depressing atmosphere of the Italian campaign, a campaign of frustration and disappointment.

There had been nothing quite like "The Champagne War" of August-September, 1944, and perhaps there never was anything like it again.

FLIGHT— an Anthology

CLOUD FLYING

I shall never forget the first time that I flew really high, and, looking down, saw wave after wave of white undulating cloud that stretched for miles in every direction like some fairy city. I dived along a great canyon; the sun threw the reddish shadow of the plane on to the cotton-wool walls of white cliff that towered up on either side. It was intoxicating. I flew on. Soon I could see nothing and had to rely on my instruments. I did a slow roll. This was extremely stupid apart from being strictly forbidden. My speed fell off alarmingly. I pushed the stick forward: the speed fell still farther and I nearly went into a spin. I could not tell whether I was on my back or right way up, and I felt very unhappy. I lost about 2,000 feet and came out of the cloud in a screaming spiral, but still fortunately a long way above the earth. I straightened up and flew home with another lesson hard learned.

—By Richard Hilary (from "The Last Enemy")

A VISION

The rocks are cloven, and through the purple night
I see cars drawn by rainbow-wingèd steeds
Which trample the dim winds: in each there stands
A wild-eyed charioteer urging their flight.
Some look behind, as fiends pursued them there,
And yet I see no shapes but the keen stars:
Others with burning eyes, lean forth, and drink
With eager lips the wind of their own speed,
As if the thing they loved fled on before,
And now, even now, they clasped it. Their bright locks
Stream like a comet's flashing hair: they all
Sweep onward.

—By Percy Bysshe Shelley (from "Prometheus Unbound")

THE BAT

The bat is hunting softly by my door,
And, noiseless as the snowflake, leaves his lair:
O'er the still copses flitting here and there,
Wheeling the self-same circuit o'er and o'er.

—By C. T. Turner (from "A Summer Twilight")

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KENT COAST

Alone 'twixt heaven and earth I float
On ocean's breast a tiny mote.
The cries of children in the bay
Come faintly as from far away,
Yet when I turn my head I see
Them wading boldly to the knee.

Dissolved and bodiless I seem,
As immortal as a dream;
This is true leisure, to be free,
To lie at ease upon the sea,
This is true faith, to be at rest
Upon the water's heaving breast,
And this is pleasure deep and true,
To look into the eternal blue
Till Heaven itself seems shining through.

Now past the sun, across the sky,
Nine lovely shapes go sailing by,
Keeping their perfect pace and swing,
As though they heralded a king.
Serene they pass, with silver flight,
Like fairies in a summer night,
While I turn slowly to the shore.
Oh! never have there been before,
While other Augusts have slipped by,
Alone beneath a cloudless sky,
Nine aeroplanes, the sea and I.

—By Margaret E. Blizzard (from "Icarus, Anthology of Flight").

THE FLYING THRILL

What is the thrill of this flying game?
It is the excitement when the throttles are pushed open and you feel yourself being hurtled over the ground, faster and faster, when you abandon yourself to the power of the engines, anticipating the time when you will become airborne. It is also the end of your patrol when, with the flarepath ahead, you begin your approach, see the familiar lights and know that over there —though you cannot see the building—is the place where you eat and sleep, where after the loneliness of the dark sky there are friendly faces, a bright fire, the smell of cooking. Sometimes it is, perhaps, the feeling of detachment and remoteness from the earth when you break into the full light of the moon above a woolly mattress of cloud. It is the chase, the mastery over the machine and over distance. It is a hundred other things dull and interesting, wearying and exhilarating. It is a "bind"; it is a joy.

—W. Thomas Cunningham (from "Jottings of a Night Fighter")

ENGLAND IS MY VILLAGE

They lost height till they were just above the sea, their patterned shadows sliding effortlessly over mile after mile of watery desolation. On crossing the coast the Senior Officer altered course for base. They flew at a few hundred feet over the sleepy countryside, their shadows now vaulting hedge and haystack, silently climbing ridge and col, dropping easily into shallow valleys.

The sun was still high in the sky and the country had never been more lovely. Not pretty, Robert thought, in the frills of summer, but beautiful in the starkness of winter. As he looked, first to the north at the black rich earth of the fens, marshalled by dykes, then south to the flatness of Suffolk, woolly with leaf-stripped trees, each feature of the country fitted into its place in his mind, each town he knew, hazy and grey with the mist of a winter's afternoon, each stretch of river, pregnant now with flood, each change of character from county to county. How familiar, he thought. How well I know it all. Truly, England is my village.

—By John Llewelyn Rhys (from "England is My Village")

THE SKYLARK

Higher still and higher
From the earth thou springest
Like a cloud of fire;
The blue deep thou wingest,
And singing still dost soar, and soaring ever singest.

In the golden lightning
Of the sunken sun,
O'er which the clouds are bright'ning,
Thou dost float and run,
Like an unbodied joy whose race is just begun.

—Percy Bysshe Shelley.

Grateful acknowledgments are made to the author for "Kent Coast"; Messrs. Faber & Faber for the passage from John Llewelyn Rhys's "England is My Village"; Messrs. Macmillan & Co. for the passage from Richard Hilary's "The Last Enemy"; the author and The Editor of THE ROYAL AIR FORCE QUARTERLY for "The Flying Thrill" from "Jottings of a Night Fighter."

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Silent Squadron

By Flight Lieutenant E. Milne, D.F.C., R.A.F. (Retd.)

I chanced to see at dead of night
A lonely squadron, in full flight
Below the clouds, beneath the moon,
Between Heath Bridge
And Wotherspoon.

Thirteen wild solan geese, they flew
By aids that nature always knew,
And gave to man through science, say,
Some fifty years ago
To-day.

No lights were carried as they went
In one long vee through darkened Kent,
In time they faded out to sea
And left my thoughts alone
With me.

What is this instinct that conveys
Such confidence in unknown ways,
And guides these sea-birds through the night,
A silent omen,
Freedom's flight?

If only they could speak and tell
Us secrets that they know so well,
Of winds and weather, stars and skies,
Dark clouds with lightning
In their eyes.

Perhaps they'd shake wise heads, and sigh
In disbelief that men should fly.
I could not brook such proud disdain
Of earthbound fledglings not
Quite sane.

And I am envious tonight
Of this wild squadron in full flight
Below the clouds, beneath the moon
Between Heath Bridge
And Wotherspoon.

Song of the Test Pilot

By Flight Lieutenant E. Milne, D.F.C., R.A.F. (Retd.)

She looks alright on the ground, sir,
But what will she do in the air?
She's trim and neat from the cockpit seat,
But her wing-tip ends are bare;
And I've a mind to go and find
The rigger who painted there.

For you know how it feels when you're up, sir,
With the first ship off the line?
On a sky-hook there, in the upper air,
And a tingling in your spine,
As you loop and roll till you know her soul
Has gone to your head like wine.

Have you ever been up when you know, sir,
That she's acting like a witch,
That the take-off wasn't so sweet as it ought,
And you look at the jettison switch,
And you laugh at yourself, and you sing, maybe,
And you know you've got the twitch?

This time last year with a Yankee job
Was the worst I ever knew.
A loop too tight, and a roll to the right
Had stripped the mainplane through,
And I thought she'd need a bit more speed
To keep her flying true.

But I didn't give her enough, sir,
And she stalled on me, coming in,
No warning shudder or kick of the rudder
To tell me my speed was thin.
But a wicked swing of the starboard wing
(And I guess she thought she'd win).

I looked at the ground below, sir,
And I thought the end was plain,
But I gave her the gun, looked up at the sun
And went on round again.
I felt a bit queer when I taxied clear
(But I have a worrying brain).

So that's why I look them over now,
And that's why I wouldn't dare
Touch her, until the rigger
Had checked the wing-tips there.
But she looks all right to me now, sir,
So I'll see what she's like in the air.

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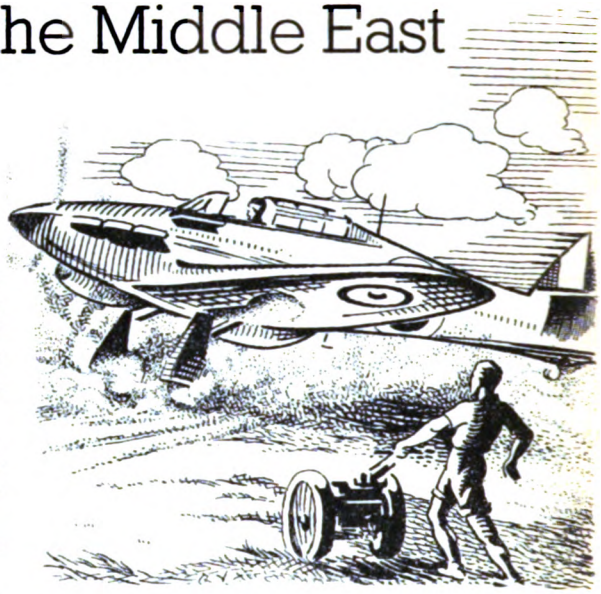
Air Operations in the Middle East

From 1st January 1941 to 3rd May 1941



THE following despatch was submitted to the Secretary of State for Air on 24th November, 1941, by Air Chief Marshal Sir Arthur Longmore, G.C.B., D.S.O., Air Officer Commanding-in-Chief, Royal Air Force, Middle East.

This despatch covers the period from 1st January, 1941, to 3rd May, 1941. On this latter date I was recalled to England and did not return to resume command of the R.A.F., Middle East.

The main features to be recorded during these four months can be summarized as follows:

(*a*) The complete defeat of the Italian Air Force in Libya; the successful and rapid advance to Benghazi (6th February) and the subsequent temporary stabilization in Cyrenaica as far West as El Ageila.

(*b*) The reduction of British Forces in Cyrenaica, both Army and Air, in order to meet fresh Greek commitments due to development of the threat to Greece from German forces which had crossed from Roumania into Bulgaria. The decision being made on 22nd February to send British Land Forces to Greece.

(*c*) The subsequent German-Italian offensive in North Africa leading to the withdrawal of British Forces in Cyrenaica to the Frontier and to the isolation of Tobruk.

(*d*) The German invasion of Yugoslavia and Greece on 5th April, resulting in the capitulation of the armies of both countries and the evacuation of British Forces to Crete and Egypt.

(*e*) Intensified attacks on Malta and Naval communications in that area by German aircraft based in Sicily.

(*f*) The successful offensives against Italian East Africa from Kenya and Sudan, including the reoccupation of Berbera.

Note.—A separate report has been rendered on the R.A.F. operations in Crete from 17th April to 31st May, the control of which ceased to be my responsibility from 3rd May. On that date the German Air Invasion of the Island had not yet developed.

The full report on Air Operations in East Africa from 10th February to 5th April, 1941, has been forwarded to Air Ministry, but a Summary of these operations is included in this Despatch.

The location of units in the Middle East Command on 1st January, 1941, is the same as that given in Despatch No. 1 for 31st December, 1941, and is repeated at Appendix "A." Appendix "B" gives the location of units as at 30th April, 1941.

Libya

In my previous Despatch* I recorded in para. 28 that by 31st December, 1940, the whole territory east of the Italian-Egyptian frontier was in our hands. The Army had already advanced to positions surrounding Bardia and forward patrols had already penetrated towards Tobruk.

Air operations were continued in direct support of the Army, all types of aircraft contributing to this end during the advance, the role of squadrons being as follows:

Heavy bombers attacked military objectives by night, such as Bardia and Tobruk, prior to the assault by our troops. At other times their objectives included Benghazi Port and aerodromes.

Medium bombers, immediately prior to attacks on Bardia, Tobruk and Derna, were employed in a similar role to the heavy bombers both by day and night and at other times attacked enemy aerodromes. No. 113 Squadron, and later No. 55 Squadron, continued to provide strategical reconnaissance.

The activities of our fighters were varied. They provided reconnaissance, made low flying attacks on mechanical transport on the enemy's lines of communication, in addition to providing air protection to our own troops against enemy air action.

Army Co-operation aircraft were employed

* Not published.—Ed.

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mainly on tactical reconnaissance with Hurricanes or Gladiators. Lysanders were used to a limited extent for spotting artillery bombardments.

Early in January the Italian Air Force was still very active despite the heavy losses already inflicted on it.

As a prelude to the Army's assault, Bardia was subjected to a heavy naval and air bombardment. Thus, during the night 1st/2nd January, following many previous attacks, Wellingtons and Bombays, together with Fleet Air Arm Swordfish, dropped over 20,000 lb. of bombs on enemy defences and troop positions. Blenheims continued to attack during the day on 2nd January, making forty-four bombing sorties, followed during the night of 2nd/3rd January by further efforts of Wellingtons and Bombays which dropped another 30,000 lb. of bombs. The total load of bombs dropped during this series of attacks amounted to over forty tons.

At the same time Blenheims bombed enemy aerodromes concentrating on Gazala, Derna and Tmimi. Hurricanes of Nos. 33, 73 and 274 Squadrons maintained offensive patrols over Bardia during the attack.

The Army attacked Bardia at dawn on 3rd January, the assault being made by armoured forces in co-operation with Australian infantry. During the battle, Blenheims effectively bombed troop concentrations while aircraft of No. 208 (A.C.) Squadron co-operated with artillery. Gladiators of No. 3 R.A.A.F. (Australian) Squadron maintained low flying offensive patrols to cover our troops as they advanced.

As soon as the attack had been launched a large proportion of our bombing effort was turned on to aerodromes in Cyrenaica, with the intention of pinning down and destroying the enemy air force.

Fighting at Bardia continued until 1330 hours on 5th January, when the enemy ceased to offer any further resistance.

By 6th January our Armoured Forces, advancing under cover of offensive fighting patrols, had reached the outer perimeter defences of Tobruk. They also occupied El Adem aerodrome on that date, capturing forty unserviceable aircraft which had been abandoned by the Italians on the landing-ground there. A further thirty-five burnt-out aircraft were found by armoured patrols at Gazala a few days later.

On 10th January, Headquarters No. 202 Group, together with the Western Desert Squadrons, started to move forward. By the middle of January, Headquarters No. 202 Group was established at Sollum, and bomber and fighter squadrons had moved forward to landing-grounds in the Sollum-Bardia area, with No. 208 Squadron and No. 3 R.A.A.F. Squadron farther forward at Gambut.

Operations now passed through a stage of preparation and consolidation before the attack on Tobruk. During this period heavy bombing attacks were continued against Tobruk to wear down the enemy and destroy his defences. Enemy aerodromes were consistently and effectively bombed, particular targets at this time being Berka and Benina, near Benghazi, to which the enemy had been compelled to withdraw his bomber forces as a result of our continued attacks on his more forward aerodromes. Port facilities and shipping at Benghazi and military objectives at Derna were also attacked. It now became evident that the aircraft losses inflicted on the enemy, both on the ground and in the air, were resulting in reduced activity of his air force, and from that time onwards our own aircraft operated with comparative immunity.

As in the case of Bardia, the assault on Tobruk was preceded by a naval bombardment and heavy bombing attacks from the air. On the night of 19th/20th and 20th/21st January, Wellingtons and Blenheims dropped twenty tons of bombs, inflicting heavy damage on the defences and other military objectives at Tobruk, including the A.A. guardship, *San Georgio*. The assault on Tobruk was launched at dawn on 21st January and, simultaneously, Blenheims of Nos. 45, 55 and 113 Squadrons, operating in direct support of our troops, attacked enemy positions within the Tobruk defences, maintaining their attacks throughout the day and making a total of eighty-seven sorties. The Gladiators of No. 3 R.A.A.F. Squadron, and Hurricanes of Nos. 73 and 274 Squadrons maintained offensive patrols westwards of Tobruk to cover ground operations, but very few enemy aircraft appeared and only one engagement took place.

Operations continued on 22nd January. Aircraft of No. 208 (A.C.) Squadron provided close support for our troops. Early in the morning the Australians entered the town, while the Free French companies penetrated the perimeter near the sea to the West. All organized resistance was at an end by the evening.

Between the fall of Tobruk and 1st February the following moves were made. Headquarters, No. 202 Group, moved forward to Sidi Mahmoud; Nos. 73 (F) and 274 (F) Squadrons to Gazala and No. 3 R.A.A.F. (A.C.) Squadron and No. 208 (A.C.) Squadron to El Tmimi.

The main body of our forces now pushed on northwards to Derna and our armoured formations westwards to Mechili. Enemy air activity

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was on a small scale, but as the advance approached Italian base aerodromes a certain number of fighters continued to attack our forward troops. They were, however, successfully dealt with by our own fighter patrols which prevented the enemy from inflicting any serious casualties or from materially influencing the rapid progress of the advance. The intensity of our own air operations at this stage was also somewhat reduced, due partly to unserviceability through long flying hours under desert conditions, but also through our inability to establish forward landing-grounds sufficiently rapidly to keep pace with the advance. The over-ponderous standard squadron organization did not lend itself to such conditions, and, moreover, very few transport aircraft were available. However, the Blenheims and Wellingtons, not being so dependent on advanced landing-grounds, were able to continue bombing enemy aerodromes.

Our armoured forces entered Mechili on 27th January, and on 30th January Derna fell to the forces which had advanced to the north. Like Bardia and Tobruk, Derna had already been regularly and heavily bombed for a considerable period and was not, therefore, subjected to concentrated bombing attacks immediately prior to the assault. Fighter patrols, however, provided constant cover for the troops and continued to harass the enemy on his lines of communication throughout the operations.

The advance continued and Cyrene was occupied on 3rd February. A rapid withdrawal of enemy forces now took place; M.T. and troop convoys retreating westwards from Barce were repeatedly attacked by Blenheims and harassed by fighters.

The Australians now advanced on Benghazi from the north, while on 4th February our armoured forces started their remarkable dash across the desert from Mechili to the coastal road south of Benghazi. The interception, which completely surprised the enemy, took place at Beda Fomm, approximately thirty miles south of Solluch, on 5th February. The enemy, supported by strong armoured car formations, tried to break through, but were repulsed with heavy losses and the greater part of their forces were captured or destroyed.

Meanwhile, as the Australians advanced on Benghazi, our medium and heavy bombers maintained their attacks on Berka and Benina aerodromes and on the railway at Barce which was being used by the enemy for the withdrawal of his forces from that area.

Our troops occupied Benghazi on 6th February, meeting little resistance in the final stages. The R.A.F. occupied Benina aerodrome on 10th February and found eighty-seven unserviceable and damaged enemy aircraft there, which, together with those found at other aerodromes, notably El Adem and Gazala, were an indication of the effectiveness of the numerous bombing attacks made on enemy air force objectives and accounted very largely for the virtual collapse of the Italian Air Force during the latter stage of the advance.

Following the British occupation of Benghazi, the remnants of the enemy forces retreated westwards into Tripolitania, while the Italian Air Force had been so depleted as to be incapable of offering any serious threat for the time being. Thus it appeared improbable at that time that the enemy would be able to stage an early counter-offensive in Libya. Meanwhile, the increasing gravity of the situation in Greece called for the early despatch of further air reinforcements to that theatre and the consequent reduction of the Royal Air Force in Cyrenaica.

The next phase, therefore, consisted of the reorganization and redistribution of forces. H.Q. No. 202 Group, Nos. 45 and 113 (B) Squadrons, and No. 274 (F) Squadron were withdrawn to the Delta area in the middle of February. No. 208 (A.C.) Squadron was withdrawn at the end of February, but was replaced by No. 6 (A.C.) Squadron of which two flights were at that time already in Cyrenaica, the remainder of the squadron being transferred to Aqir (Palestine).

H.Q., R.A.F., Cyrenaica was formed at Barce on 25th February, 1941, under the command of Group Captain L. O. Brown, D.S.C., A.F.C.

The squadrons remaining in Cyrenaica in March, 1941, were disposed as follows:

No. 3 Squadron R.A.A.F., which by that time was completely rearmed with Hurricanes, was located at Benina to provide the air defence of Benghazi.

No. 73 (F) Squadron, at first located at Gazala, was moved to Bu Amed on 14th March to defend the Tobruk area.

The Headquarters and one flight of No. 6 (A.C.) Squadron (Hurricanes and Lysanders) was at Barce, with a flight at Agedabia and sections at other landing grounds in Western Cyrenaica.

No. 54 (B) Squadron was at Bu Amed until 10th March, when it moved to Maraua.

Enemy air activity increased shortly after our occupation of Benghazi. It was at this time that *German* aircraft, operating from landing grounds near Tripoli, began to attack our forces in Cyrenaica, at first using Ju.87's and Ju.88's. German fighters started to operate at a slightly later date from advanced landing grounds, Me.110's making their first appearance, followed

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shortly afterwards by Me.109's. Before the end of February the Germans had assumed a leading role in the enemy air effort.

The enemy's main bombing objective at first was Benghazi, which was attacked regularly and with some intensity between 14th and 20th February. Subsequent attacks, however, covered a wider range of objectives including Tobruk, our aerodromes in Cyrenaica and troops in the forward area at Agheila and Agedabia. It was in fact due to this somewhat unexpected increase of enemy air activity, coupled with the presence of German fighters, that No. 73 (F) Squadron was retained in Cyrenaica when it had previously been intended to withdraw it from that front to provide further reinforcement for Greece.

Reconnaissance of Tripoli harbour from the middle of February onwards revealed considerable quantities of shipping using the port, and it soon became evident that the enemy was being rapidly reinforced. In addition to seaborne reinforcements, the enemy carried considerable numbers of troops to Tripoli by air in Ju.52's. German troops were included in the reinforcements and early in March it was estimated that the greater part of a German division had already arrived in Tripolitania.

It was essential therefore to maintain attacks on shipping and harbour facilities at Tripoli to impede the flow of enemy reinforcements and supplies to Libya. Wellingtons of Nos. 38 and 70 (B) Squadrons, operating from landing grounds in Cyrenaica, accordingly bombed these objectives, making a total of forty sorties against Tripoli during February and March. Further attacks on Tripoli were made by F.A.A. Swordfish as well as Wellingtons operating from Malta. Considerable damage was inflicted during these operations but the total effort which could be made available was insufficient to cause any serious obstruction to the arrival of enemy reinforcements. Other Wellington operations included attacks on aerodromes in Tripolitania and on shipping at Syrte which the Germans were developing as a forward base.

A brief appreciation of the air situation, dated 6th March, was prepared for the information of the Foreign Secretary, Mr. Eden, who had arrived in Cairo in company with the C.I.G.S. on 19th February.

It was at this time, particularly, that the weakness in number of modern aircraft at my disposal, chiefly Hurricanes and Blenheims, caused me the gravest concern. It had been anticipated that with the defeat of the Italian Air Force in Cyrenaica a quiet period on that front would justify considerable reduction in air strength. This proved to be far from the case, and it became apparent that air reinforcements would have to be sent to Cyrenaica immediately to prevent the enemy thrust from developing into a serious threat to Egypt.

We were already heavily committed in Greece and more help had been promised. Squadrons were awaiting new aircraft in replacement of wastage, yet the promised arrival in Egypt of large air reinforcements from home both via Malta and Takoradi, in spite of periodical emergency ferrying operations by aircraft carriers, did not materialize and it was not until the latter end of April that the situation in this respect began to improve. Moreover, though ships were arriving via the Red Sea at Suez quite regularly, there was no steady supply of cased aircraft by this route during the whole of January, February and March.

American Tomahawk fighters, which were beginning to come over from Takoradi, were at this time suffering from various "teething troubles" and were not yet ready for effective operation.

Not only was the Air Force at my disposal insufficient for the commitments which had arisen, but the rate of replacement, either actual or within reach, was not sufficient to keep pace with wastage. Whereas the losses from all causes from 1st January, 1941, to 31st March, 1941, were 184, during the same period the actual arrivals in Egypt via Takoradi and Malta were 147 and 19 respectively, or a total of 166.

As will be seen later in this despatch, during the whole of March and April this factor of waning resources had to be taken into account in deciding how to employ the Air Force at my disposal economically and to the best advantage.

Early in March, increasing numbers of enemy M.T. were observed by air reconnaissances to be moving eastwards along the coastal roads, and by 10th March large enemy concentrations were located in the area immediately west of Agheila. Simultaneously the enemy established forward landing-grounds at Tamet, Syrte and El Makina.

By the middle of March it was estimated that the German forces in Libya had been built up to two divisions, one of which was armoured. With this increase of strength in personnel and equipment, the enemy forces gradually assumed an offensive role. At the same time, enemy aircraft reconnoitred our forward positions apparently with the object of ascertaining the strength of our forces.

On 19th March an enemy patrol occupied the landing-ground at Marada, about eighty miles south of Agheila. This move was a forerunner of increased activity by strong enemy patrols which necessitated the withdrawal of our outposts from Agheila, the enemy occupying the fort there on

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24th March. Italian infantry, supported by German armoured forces and dive-bombers, moved east of Agheila on 30th March, and on 31st March our forward troops were compelled to fall back on Agedabia. Blenheims of No. 55 Squadron bombed and machine-gunned enemy M.T. concentrations, while the landing-ground at Misurata, from which enemy aircraft were operating in support of their advance, was successfully attacked by Wellingtons and Blenheims. The superior weight of the enemy enabled him to continue his advance, however, despite the opposition of our troops and aircraft.

On 2nd April the enemy continued to advance in Cyrenaica, compelling our forward troops to withdraw from Agedabia. The situation in Benghazi thus became precarious, and orders for demolitions were issued. Preparations were made for the withdrawal of all R.A.F. units from that area, and Benina was evacuated during the early evening of 2nd April, all demolitions having been completed.

Although handicapped by the frequent moves of the ground echelon necessitated by rapid withdrawal, squadrons continued to operate in direct support of the Army. Blenheims of No. 55 (B) Squadron, reinforced by No. 45 Squadron, provided reconnaissances, attacked concentrations of enemy M.T. and A.F.Vs., and bombed forward enemy aerodromes. Hurricanes of No. 3 Australian Squadron and No. 73 (F) Squadron maintained constant patrols, covering our troops as they withdrew to new positions and making many effective attacks on enemy M.T. concentrations. Wellingtons also made night attacks on enemy M.T. in addition to maintaining their offensive against Tripoli whilst they were still within striking range of that objective. No. 6 (A.C.) Squadron continued to operate directly under the control of the Army and provided such tactical reconnaissances as were possible with their limited capacity and under conditions in which their ground echelons, like those of the other squadrons, were constantly on the move.

For the next few days complete details of the movement of our own and enemy troops remained somewhat obscure. At times it was difficult for Army Co-operation aircraft to keep track of the movements of the particular force with which they were working. For instance, on 2nd April, both the Flight of No. 6 (A.C.) Squadron and the H.Q. of No. 2 Armoured Division, with which they were operating, spent the night at Antelat, but on the morning of 3rd April the Flight discovered that Div. H.Q. had left and no information was forthcoming as to their movements. The Flight subsequently moved to the landing-ground at Msus, where Free French troops were unable to give any information concerning our troops in the area, nor did they know where Div. H.Q. was situated. It was not until noon that a message was received from Second Div. H.Q. which gave their position at that time as thirty miles west of Msus. A tactical reconnaissance about this time, taken by an aircraft of this Flight from Msus, reported enemy A.F.Vs. and M.T. moving towards Msus. Whether this column was, in fact, an enemy one still remains uncertain, but according to the pilot the lorries were Italian and the personnel inside them opened fire on his aircraft.

On 4th April enemy armoured forces threatened to outflank the Australian Division holding the Benina—Tocra position, necessitating their withdrawal to new positions on the Barce escarpment.

In the meantime, as the Army withdrew to new positions, our squadrons moved to landing grounds farther east. On 4th April, No. 3 Australian Squadron, No. 6 (A.C.) Squadron and Advanced H.Q., Cyrenaica, moved to Maraua, No. 55 Squadron to Derna and H.Q., Cyrenaica to Tobruk. On the same day eight Blenheims of No. 45 Squadron reinforced No. 55 Squadron.

The Australian Division withdrew to the Barce escarpment on 5th April, covered by Hurricane patrols of Nos. 3 and 73 Squadrons. The Hurricane patrols were also extended to cover elements of our troops retiring towards Mechili. In these operations, on 5th April our fighters destroyed fourteen enemy aircraft for a loss of two Hurricanes.

By 7th April the Australian Division and support group had withdrawn, first to Derna and then to Gazala area. Meanwhile, our armoured forces, which had already suffered heavy losses, had fallen back on Mechili and joined up with the Indian Motor Brigade. At this stage R.A.F. Squadrons had withdrawn to aerodromes in the Tobruk area, and further movements were necessary on 8th April when the Blenheim Squadrons and No. 3 R.A.A.F. Squadron withdrew to landing grounds East of the Cyrenaica-Egyptian frontier, and the Wellingtons to their bases in the Fuka area. No. 6 (A.C.) and 73 (F) Squadrons continued to operate from landing grounds within the Tobruk perimeter.

The Australian Division withdrew to the outer perimeter of Tobruk on 10th April. The following day enemy A.F.Vs. cut the road between Tobruk and El Adem and our support group retired towards Sollum. From Mechili the enemy's forward troops continued their advance, and by 13th April they had occupied Bardia and the Sollum escarpment where their advance was temporarily halted.

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The situation by 13th April had become more stabilized and was as follows:

The enemy's thrust in the forward area at Sollum had lost momentum and there were indications that his troops there were experiencing administrative difficulties as a result of their rapid advance.

Tobruk was held by a strong force of our troops and was invested by the enemy whose troops were concentrated west and south of the perimeter, with armoured forces astride the El Adem road.

H.Q. No. 204 Group, which formed at Maaten Bagush on 12th April under the command of Air Commodore R. Collishaw, C.B., D.S.O., O.B.E., D.S.C., D.F.C., had taken over the control of the squadrons in the Western Desert from H.Q. Cyrenaica.

The tasks of the R.A.F. at this stage were:

(*a*) To continue to attack lines of communication to aggravate the enemy's existing M.T. difficulties.

(*b*) To provide close support for the Army by attacking enemy A.F.V's., M.T. concentrations and troops both in the forward areas and at Tobruk.

(*c*) To attack enemy aerodromes, primarily with the intention of destroying his transport aircraft which he was using to supply his forward troops.

(*d*) To bomb harbour facilities and shipping at Benghazi in order to interrupt the use of the port by the enemy and thereby prevent him from shortening his long lines of communication from Tripolitania.

(*e*) To provide the fighter defence of Tobruk.

Soon after the investment of Tobruk it became evident that it would no longer be possible to maintain No. 6 (A.C.) and No. 73 (F) Squadrons on the aerodrome within the perimeter. In addition to frequent dive-bombing attacks, which were liable to destroy or damage the aircraft beyond repair capacity available, the landing-ground was within range of enemy artillery fire. These squadrons were accordingly withdrawn to aerodromes in the vicinity of Maaten Bagush, with advanced landing-ground near Sidi Barrani for refuelling.

Owing to the distance of Tobruk from these aerodromes and even from the advanced landing-ground at Sidi Barrani (120 miles from Tobruk), the task of maintaining fighter defence over Tobruk Harbour at such long range became extremely difficult. In addition, the depth of enemy penetration to the East put Tripoli out of range of our Wellingtons operating from the Western Desert, and made it most difficult to provide fighter escorts to our ships supplying the Tobruk garrison. On the other hand, it enabled the enemy to develop repeated bombing attacks on Tobruk without regular fighter interference, and it reduced the distance for his bombers operating against Alexandria or ships in the Eastern Mediterranean.

After a German-Italian attack on Tobruk on 14th April, when No. 73 (F) Squadron shot down nine enemy aircraft for the loss of two, there followed a period of comparative inactivity from a military standpoint. In the Sollum area, patrols of our mobile forces made raids well behind the enemy's forward troops. The enemy, however, continued to supply his forward areas by means of M.T. and transport aircraft, although harassed by the activity of our mobile patrols and the continued attacks of our aircraft on his lines of communication and forward aerodromes.

Enemy air activity at this stage was concentrated largely on Tobruk, apparently with the primary intention of denying the port to us. Hurricanes of No. 73 Squadron, providing the fighter defence of Tobruk, on several occasions engaged greatly superior numbers of the enemy with success, although not without loss to themselves. As an example, in a series of raids on Tobruk during 22nd and 23rd April, in which the enemy employed a total of 100 bombers and about 150 fighters, Hurricanes destroyed twelve enemy aircraft and probably destroyed a further two with a loss to themselves of three Hurricanes.

The scale of our attack against enemy aerodromes was somewhat increased from about 20th April to the end of the period under review. More than sixty sorties by Wellingtons and Blenheims were made during this particular period, the main weight of this effort being directed against the enemy's forward aerodromes at Derna and Gazala, and the base aerodrome at Benina.

By this time our squadrons in the Western Desert had been further reinforced by detachments of No. 274 (F) Squadron, Hurricanes, and No. 39 (B) Squadron, Marylands, the latter being employed mainly for strategical reconnaissances. No. 3 Squadron R.A.A.F. was withdrawn from the Western Desert on 21st April and moved to Aboukir for rest after continuous fighting since 7th November, 1940.

Towards the end of the period under review, military activity increased, both in the frontier area and at Tobruk. The enemy's forward troops on the Sollum escarpment, after being heavily reinforced with A.F.Vs. advanced eastwards on 27th April and occupied Halfaya Pass. This appeared to be his main objective for, after establishing a forward line between Halfaya and Sidi Omar he made no attempt to continue his advance.

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At Tobruk the enemy made a further determined attack on 1st May, employing sixty tanks supported by infantry and accompanied by heavy air attacks on our troops and defences. The enemy succeeded in breaking the outer defences of the perimeter but failed to pierce our main defences. Fighting continued for two days and on 1st May, Hurricanes of Nos. 73 and 274 Squadrons maintained fighter patrols to protect our troops and artillery against enemy fighter and bomber action. The Hurricanes encountered enemy fighters, in greatly superior numbers but shot down four Me.109's in flames, with the loss of one Hurricane. Our troops successfully counter-attacked, destroying eleven enemy tanks and inflicting other heavy losses. The enemy, however, retained a hold on 5,000 yards of the outer perimeter and our line was adjusted accordingly. A further attack by the enemy on 2nd May was repulsed, after which the enemy effort there appeared to be temporarily spent.

A feature of the operations of this period was the high scale of effort maintained by a comparatively small air force working under the difficult conditions imposed by the enemy's rapid advance. From 1st April to 3rd May more than 400 bomber and fighter sorties were made against enemy M.T. convoys and concentrations, A.F.Vs. and troops. Over seventy Wellington and eighty Blenheim sorties were made against enemy aerodromes and sixty-four Wellington and twelve Blenheim sorties were made against Benghazi. In addition, Hurricanes on several occasions machine-gunned aerodromes, and in the course of numerous patrols destroyed seventy-three enemy aircraft in combat and probably destroyed a further sixteen, with a total loss of twenty-two Hurricanes.

It would be true to say that the German-Italian success in regaining Cyrenaica was due more to the number, efficiency and mobility of their ground forces than to their numerical air superiority. At no time did the German-Italian Air Forces completely dominate the situation on this front.

From January to mid-February, Air Commodore R. Collishaw, C.B., D.S.O., O.B.E., D.S.C., D.F.C., continued in command of No. 202 Group, R.A.F., in these successful operations which culminated in the occupation of Cyrenaica. He maintained the high standard of resource and initiative which I had grown accustomed to expect from him, and he was an inspiration to all those under his command.

Group Captain L. O. Brown, D.S.C., A.F.C., continued to render most valuable service on the staff of the G.O.C. in arranging the tasks of the reconnaissance squadrons under the operational control of the Army. On 25th February he assumed command of the reduced Air Force in Cyrenaica and remained in command during the subsequent withdrawal, during which time he contrived to operate his small force to the best advantage under most difficult conditions.

The work of No. 3 Royal Australian Air Force, under the command of Squadron Leader I. D. Maclachan, D.F.C., was outstanding. They were continuously in the Western Desert or Cyrenaica for six months, first with a mixture of Gladiators, Gauntlets and Lysanders and later with Hurricanes. Their high morale and adaptability to desert conditions were remarkable.

Other squadrons which particularly distinguished themselves on this front were No. 73 (Hurricane) Fighter Squadron and No. 55 (Blenheim) Bomber Squadron, which did most of the long-distance strategical reconnaissance.

Mention must also be made of No. 2 R.A.F. Armoured Car Company which remained working with the Armoured Division throughout the successful phase of the operations, attached to the XI Hussars.

Greece

The Greek advance had lost its impetus by the beginning of the year as the result of increased enemy resistance, lengthened lines of communication and severe winter conditions. The Greeks still retained the initiative, however, and after operations had apparently become static they made a further advance, capturing Kelcyre on 8th January, 1941, and thereafter making slow progress along the northern side of the Kelcyre-Tepelene gorge. There was little activity in other sectors.

The R.A.F. squadrons based in Greece, under the command of Air Vice-Marshal J. H. D'Albiac, D.S.O., on 1st January, 1941, were:

No. 30 (F) Squadron (Blenheim Fighters).
No. 80 (F) Squadron (Gladiators).
No. 84 (B) Squadron (Blenheims).
No. 211 (B) Squadron (Blenheims).

In addition, detachments of Wellingtons of Nos. 37 and 70 (B) Squadrons based in Egypt operated during moon periods from aerodromes in Greece.

The continued arrival of Italian reinforcements in Albania presaged an offensive, to counter which the Greeks would require the maximum air support that could be made available. Thus No. 112 (F) Squadron (Gladiators) was withdrawn from the Western Desert early in January, and No. 11 (B) Squadron (Blenheims) and No. 33 (F) Squadron (Hurricanes) were also withdrawn after the capture of Bardia and despatched to Greece, as follows:

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Middle East operations, 1939-41

Air Chief Marshal Sir Arthur Longmore, A.O.C.-in-C., Middle East Command, 1941, on a flying visit to R.A.F. stations and units of his far-flung command. His despatch covering these operations is published in this number.

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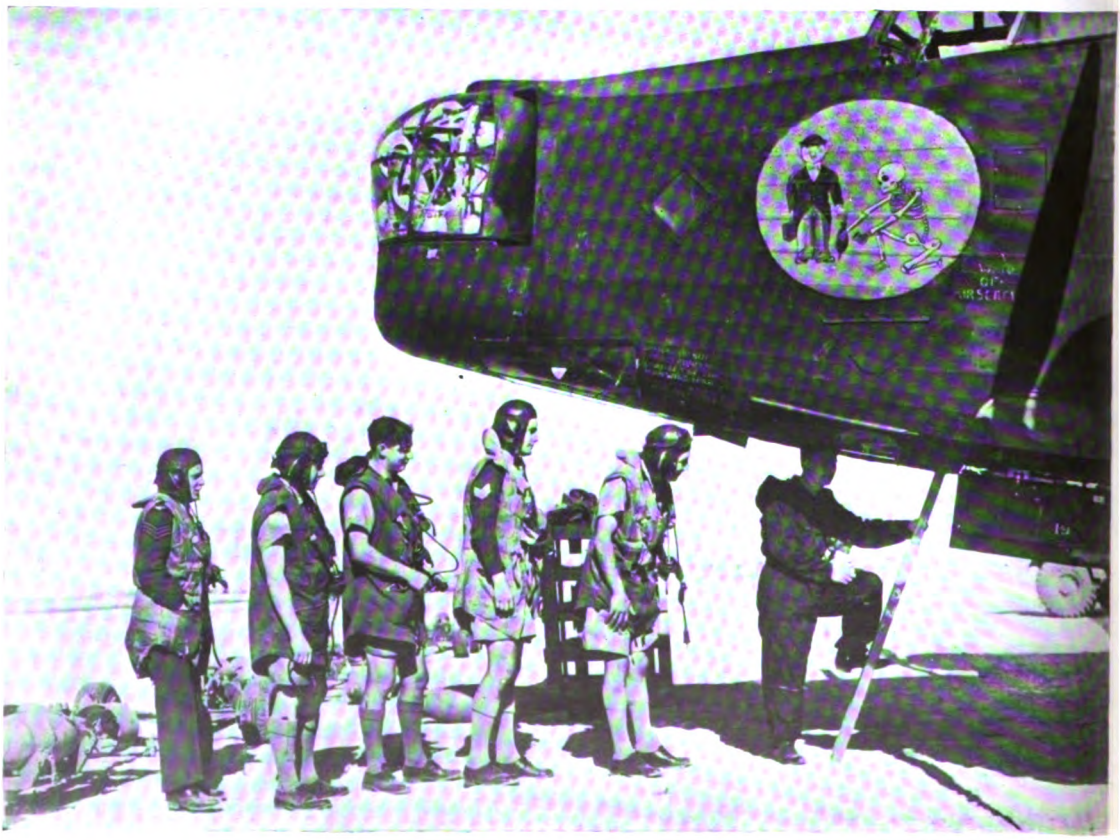
Three Wellingtons flying over shipping at Suez.



A Wellington Bomber crew goes aboard.

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No. 11 (B) Squadron—24th January.
No. 112 (F) Squadron—10th February.
No. 33 (F) Squadron—19th February.

A situation calling for further reinforcements for Greece was created by the threatened German invasion through the Balkans. Accordingly, by 31st March, No. 113 (B) Squadron (Blenheims) had also been despatched from Egypt to Greece and No. 208 (A.C.) Squadron (Hurricanes and Lysanders) was re-equipping and preparing to move at an early date.

Although the Greek Air Force operated with success in the early days of the war its activities were much reduced latterly by the inability of the Greeks to make good their aircraft casualties. Thus, practically the whole of the air effort in this theatre devolved upon the R.A.F., which was consequently called upon to attack strategical objectives, to operate in direct support of the Greek Army, necessary in order to maintain their high morale, and to provide the fighter defence of the Athens area. To meet these requirements, squadrons were employed in the following roles:

Wellingtons operating by night attacked ports in Albania and, to a less extent, in Southern Italy to interrupt the flow of enemy supplies and reinforcements to Albania.

The primary role of the Blenheims was to provide direct support for the Greek Army by attacking:

(*a*) enemy lines of communication and important centres behind the forward area to prevent the distribution of supplies and reinforcements, and

(*b*) enemy positions in the forward area.

Blenheims also attacked ports in Albania by night and day and provided strategical reconnaissance of ports in Southern Italy and Albania.

Hurricanes and Gladiators were employed in escorting Blenheims during many of their daylight bombing attacks, in maintaining offensive patrols and in protecting the Greek troops against enemy air action.

Blenheim fighters continued to provide the air defence of the Port and Air Bases in the Athens area.

In addition to the commitments already referred to, Wellingtons and Blenheims operating from Greece were called upon to attack enemy aerodromes in the Dodecanese from which enemy aircraft were carrying out minelaying operations in the Suez Canal, as well as air attacks on our convoys proceeding to Greece.

For the first two months of the year extremely unfavourable weather conditions persisted, preventing our aircraft from operating with any degree of intensity. Although both sides were similarly handicapped, it was more to our disadvantage in that, *inter alia*, it prevented our own aircraft from attacking ports in Albania and Southern Italy with sufficient intensity to do more than embarrass their use by the enemy. Thus, despite the damage inflicted and the nuisance value of our attacks, the Italians still continued to land reinforcements and supplies in Albania.

The bad weather prevailing at the time of the Greeks' capture of Kelcyre on 8th January prevented our aircraft from operating in close support of their troops during their advance; in fact, until the middle of February operations were of necessity of a sporadic nature, the weather and state of aerodromes on occasions preventing our aircraft from operating for several days at a time. Subsequently, on 10th January, as the Greeks continued to make slow progress towards Tepelene, Blenheims attacked enemy troops retiring from Kelcyre towards Berat. Otherwise, support to the Greek forces at this time was confined to Blenheim attacks on the bases at Berat, west of the Central Sector, and Elbasan, beyond the Northern Sector.

Towards the end of January the fighting round Tepelene increased in intensity as reinforcements reached the Italians, enabling them to stiffen their resistance against the Greek thrusts. During this period and up to the middle of February periodical attacks continued against Elbasan in the north, and Berat, Boulsar and Dukaj in the Tepelene area where military buildings and troop concentrations were bombed.

By the middle of February there were indications that the threatened Italian counter offensive would not be long delayed. With the Greeks retaining the initiative the ground operations had developed into a series of attacks by the Greeks followed by fierce Italian counter-attack this activity being concentrated in the Tepelene area. A brief spell of improved weather conditions at this time enabled our aircraft to operate with greater freedom, 108 sorties being made between 11th and 18th February in support of the Greek forces which were making a strong effort at that time to capture Tepelene. In these operations, stores, M.T. convoys and enemy troop and gun positions in the Tepelene area were persistently and effectively attacked by bomber and fighter Blenheims.

Air activity reached a peak on 13th/14th February when, following a series of ineffective Italian counter-attacks, the Greeks launched a new offensive against enemy positions around Tepelene. Our aircraft made fifty sorties in direct and close support of the Greek troops as they advanced and captured important positions in the mountains to the north and south of Tepelene.

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Following this short favourable spell, weather conditions again deteriorated after the middle of February, but although this curtailed operations to some extent our aircraft continued to provide support for the Greek Army which maintained its pressure on the enemy. Between 19th February and 4th March approximately ninety Blenheim sorties were made against enemy troop concentrations, gun emplacements and M.T. convoys in the Southern and Central Sectors in an endeavour to wear down the enemy resistance.

Owing to enemy fighter activity Blenheims taking part in these operations were on most occasions escorted by Gladiators or Hurricanes. Several combats with large enemy fighter formations took place, to the marked advantage of our own fighters. As an example, during a particular week of activity ending 3rd March, thirty-three Italian fighters were destroyed and a further eight probably destroyed, against which our own fighter losses were only one Gladiator destroyed, the pilot being safe, and two other fighters damaged. Such successes were by no means limited to this period and further reference is made later to the activities of our fighters.

By the beginning of March the continued arrival of enemy reinforcements by sea and air had built up the strength of Italian forces in Albania to an estimated total of twenty-nine divisions. The Greeks, however, retained the initiative, repeatedly repulsing counter-attacks and inflicting heavy losses on the enemy. On 7th March the Greeks, taking advantage of improving weather conditions, resumed their offensive against Tepelene, again assisted by our bombers which, with fighter escorts continued their attacks against enemy troop positions and lines of communication. The Greeks made local progress.

The Italians launched their counter-offensive on 9th March on a front of about twenty miles, extending from Tepelene in the Southern Sector to the Greek lines west of Corovode in the Central Sector. The enemy forces, which were estimated at about ten divisions, supported by large numbers of bomber and fighter aircraft, made continuous attacks until 14th March, but the Greeks, defending resolutely, repulsed all attacks and inflicted very heavy losses on the enemy. The Italians were unable to gain any ground and on 14th March the Greeks made a successful counter-attack, taking some prisoners.

Throughout these operations, which continued at maximum intensity between 9th and 14th March, Blenheims escorted by fighters made forty-three sorties against enemy troops, gun positions and M.T. columns, concentrating largely on objectives in the Buzi-Gilave area. At the same time Hurricanes and Gladiators engaged on escort duties and offensive patrols made fifteen and 122 sorties respectively. They fought several successful combats with enemy fighters during which they destroyed thirty-five enemy aircraft and probably another nine, with a total loss of two Gladiators and one Hurricane, the pilots of which escaped.

By 15th March the Italian offensive was reduced in intensity, although the enemy continued to make local attacks without success until 27th March. Air operations continued against enemy positions and lines of communication in all sectors although on a somewhat reduced scale as the result of a further deterioration of weather conditions.

During the period under review, Wellingtons made four sorties and Blenheims thirty sorties against shipping and port facilities at Valona. Against Durazzo, Wellingtons made eleven sorties. This effort was augmented by F.A.A. Swordfish operating from Paramythia which made bomb and torpedo attacks against shipping at these objectives, comprising seven sorties against Durazzo and twelve against Valona. A feature of these operations was the effectiveness of the F.A.A. Swordfish torpedo attacks in which five direct and two probable hits were claimed on shipping. Much damage was inflicted on port facilities, warehouses, military buildings and barracks by the Wellingtons and Blenheims. In Southern Italy, Brindisi was twice attacked by Wellingtons, the railway station being the objective on the first occasion and the aerodrome on the second. A further attack in the Brindisi area was made when fighter Blenheims successfully machine-gunned grounded aircraft at the aerodrome at Lecce (Southern Italy).

One of the most outstanding features of the campaign in Albania was the marked superiority which our fighters gained over those of the Italians. In a series of combats during the first three months of the year (1941) our fighters destroyed ninety-three enemy aircraft and probably destroyed another twenty-six, the greater proportion of the total being fighters. Against this our own fighter losses in combat amounted to four Hurricanes and four Gladiators destroyed, from which six of the pilots escaped by parachute.

Enemy aircraft operating from aerodromes in the Dodecanese periodically mined the Suez Canal and also attacked our sea convoys sailing to Greece. It became necessary, therefore, to divert a portion of the available bomber forces in Greece to attack aerodromes in the Dodecanese, with harbours and shipping as an alternative.

The main objectives were the aerodromes at

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Rhodes, viz., Maritza, Cattavia and Calato, against which twenty Wellington sorties and twenty-five by Blenheims were made from Greece. Blenheims also made a further nine sorties against the aerodrome at Scarpanto and shipping at Stampalia. Many fires were started at the aerodrome, and damage was caused to aerodrome buildings and dispersed aircraft. Direct hits were also obtained on one ship at Stampalia.

Other attacks on the Dodecanese were made by Wellingtons operating from Egypt, the total effort from Greece and Egypt combined during the period under review amounting to seventy Wellington sorties and thirty-four Blenheim sorties.

A further operation of note was the combined naval and R.A.F. action against enemy naval forces at the Battle of Matapan on 28th March.

Acting on Sunderland reconnaissance reports, Blenheims operating from Greece made five attacks comprising twenty-four sorties against enemy warships, reporting direct hits with S.A.P. bombs on two cruisers and one destroyer. One cruiser which was hit with a 500 lb. S.A.P. bomb was apparently seriously damaged. A Signal was received conveying appreciation by the Board of Admiralty on the part played by the R.A.F. in this action.

Towards the middle of February it had become clear that the German infiltration into Roumania was likely to develop into a "drive" through Bulgaria, with Salonika as the preliminary objective. The Greek Government recognized this as a very real threat, but they were anxious to avoid any action originating from their territory which might precipitate events. Though they were continually calling for more air support, they did not accept the offer of British troops until 22nd February when at a conference held at Tatoi, attended by the King of Greece, Prime Minister Korysis (who had succeeded the late General Metaxas), Mr. Eden (Foreign Secretary), General Sir John Dill (C.I.G.S.), General Sir Archibald Wavell (C.-in-C. M.E.), Captain Dick, R.N. (representing C.-in-C. Mediterranean) and myself, the decision was taken to despatch British troops at the earliest opportunity to form on the Aliakmon line to the west of Salonika.

It followed, of course, that an increased air commitment would be involved both in support of the British Army on this new front and also for air protection of the ships transporting men to Greece. Nevertheless, since the Greeks had decided to oppose a German invasion of Macedonia there was clearly no alternative to giving them the maximum assistance possible. Moreover, though German air and land forces had arrived in Tripoli these might well have been to prevent our further advance, and there was no reason on that particular date to suspect the imminent preparation of a counter-offensive in Libya. It is true, however, that such a threat developed almost immediately after the Greek commitment had been accepted.

The landing of British troops in the Athens area during March proceeded with little or no interference from the air; German infiltration into Bulgaria continued but their air activity was limited to occasional reconnaissances over Macedonia. By 1st April it was evident that the German invasion of Greece through the Balkans was imminent. Consequently, with the prospect of fighting the war on two fronts, two air formations were created, viz., Eastern Wing and Western Wing. H.Q. Eastern Wing was at Tsaritsani, in close touch with G.H.Q. British Forces and controlled Nos. 11 and 113 (B) Squadrons (Blenheims), No. 33 (F) Squadron (Hurricanes) and No. 208 (A.C.) Squadron (Hurricanes and Lysanders). The role of this force was to provide direct support for the British and Greek Armies against the prospective German attack from the north. H.Q. Western Wing was at Yannina and controlled No. 112 (F) Squadron (Gladiators) and No. 211 (B) Squadron (Blenheims), the role of this formation being to support the Greeks on the Albanian Front. The remainder of the squadrons in Greece, viz., No. 30 (F/B) Squadron (Blenheim Fighters), No. 80 (F) Squadron (Hurricanes and Gladiators) and No. 84 (B) Squadron (Blenheims), together with detachments of Nos. 37 and 38 (B) Squadrons (Wellingtons), were at aerodromes in the Athens area directly under the control of H.Q., B.A.F., Greece. No. 815 Squadron Fleet Air Arm was based on Paramythia and No. 805 Squadron Fleet Air Arm on Maleme (Crete).

Germany declared war on Greece and Yugoslavia on 5th April, 1941, and launched her attack at dawn the following day, crossing the Greek frontier into Macedonia by four routes, with the main thrust along the Struma Valley. Simultaneously they advanced westwards into Yugoslavia along the Strumica Valley in the south, from Dragoman to Nis in the north, and by other intermediate routes. The Greeks resisted strongly at Rupel, temporarily checking the German advance through the Struma Valley, but despite this opposition the Germans succeeded in penetrating Thrace and Macedonia and occupied Salonika on 8th April.

Throughout the German advance the primary task of our squadrons was to attack his A.F.Vs., M.T. columns, troops and lines of communication on the Macedonian and Yugoslavian frontiers. Practically the whole of our air effort was

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directed to this end, Wellingtons making night attacks, Blenheims operating both by night and day, with fighters constantly in support maintaining offensive patrols, making low flying machine-gun attacks on the enemy, and escorting our bombers by day. The first encounter with the German air force on this front took place on 6th April. A patrol of twelve of No. 33 Squadron Hurricanes engaged thirty Me.109's and shot down five of them without loss to themselves. During the night of 6th/7th April, six Wellingtons of No. 37 Squadron successfully bombed the railway station and marshalling yards at Sofia. From 7th to 9th April, as the Germans advanced in strength, Blenheims of Nos. 11, 84 and 113 Squadrons made heavy and effective attacks on large columns of their M.T., A.F.Vs. and troops near Petrich in Bulgari, on the Strumica—Lake Doiran Road in Yugoslavia and at Axiopolis and Polykastron in Macedonia.

By this time the German armoured forces, supported by dive-bombers, advancing westwards from Bitolj, had overwhelmed the Yugoslav Army and had succeeded in joining up with the Italians in Albania. They then advanced southward from Bitolj to Florina, threatening to isolate the Greeks in Albania from our own forces farther east. The Greeks were thus compelled to withdraw from the northern front of Albania, while our Armoured Brigade and an Australian Infantry Brigade were moved westwards to close the Florina Gap, where they were joined by a Greek cavalry division from the Koritza area. On 10th April, as the enemy continued his westward thrust into Yugoslavia, Blenheims attacked enemy M.T. columns and A.F.Vs. on the Prilep—Bitolj road, inflicting heavy damage on them. During the night of 11th/12th April, Wellingtons followed up this effort with further attacks on the enemy at Prilep and Kilkis.

Meanwhile, our forces holding the Florina Gap had been hotly attacked by the Germans on 9th April and compelled, after a strong resistance to withdraw on 11th April. By the evening of 12th April our front had been formed roughly on a line extending from the coast near Mount Olympus, along the Aliakmon River to Servia, thence north-west towards the Albanian lakes. Continued bombing and machine-gun attacks by Blenheims and Hurricanes contributed to the delay of the enemy's advance during the critical periods in which our troops were falling back on new positions. These operations were inevitably accompanied by considerable losses and in one raid on 13th April, for example, a complete formation of six Blenheims of No. 211 Squadron was destroyed by Me.109's. Wellingtons continued to attack more distant objectives. On the night of 13th/14th April a force of ten Wellingtons from Nos. 37 and 28 Squadrons made a further effective attack on the railway goods yard at Sofia, destroying a large number of trucks containing explosives. At the same time other Wellingtons bombed and machine-gunned M.T. convoys at Yannitsa and Gorna Djumaya. In operations on the following night Wellingtons destroyed the bridge over the Vardar River at Veles and Blenheims dropped bombs on enemy columns on the road from Ptolomais to Kozani. Our aircraft continued to attack similar objectives during the night of 15th/16th April and throughout the following day, to impede the enemy's advance on Katerini and Kozani.

Meanwhile the Army had stubbornly held the Mount Olympus—Aliakmon Line until 14th April, when it was turned by the Germans forcing the Kleisoura Pass. Our forces started to fall back on the Thermopylae Position on 15th April, completing the withdrawal by 20th April. This new situation necessitated the withdrawal of all R.A.F. squadrons to the Athens area on 16th April and from that date onwards they were controlled directly by H.Q., B.A.F., Greece. Eastern and Western Wings were consequently disbanded.

Continuous enemy attacks on our aerodromes, coupled with losses from enemy fighter action, had by this time considerably reduced the effective striking power of our squadrons. In a series of attacks on one day alone the enemy destroyed ten Blenheims on the ground at Niamata and damaged several other aircraft which had to be subsequently destroyed and abandoned. Several such attacks were made, during which many aircraft were destroyed or rendered unserviceable, but owing to the loss in several instances of unit records during the ultimate evacuation, full details of enemy raids are not available. Towards the end the repeated enemy attacks on our aerodromes in the Athens area caused further heavy losses, and as a final blow a force of Hurricanes retained at Argos to cover the evacuation was almost wiped out when thirteen of them were destroyed on the ground during intensive enemy air attacks on 23rd April.

In turn our aircraft attacked the German occupied aerodromes on the Salonika and Larissa Plains in an endeavour to reduce the scale of the enemy's air effort. Thus between 15th and 22nd April, Blenheims made effective night attacks on the aerodromes at Sedes, Katerina, Kozani and Larissa, starting several large fires. The effort could not, however, be maintained on a sufficiently heavy scale to cause any material reduction of the enemy's air effort, bearing in mind the comparatively large numbers of aircraft and reserves available to him.

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Nevertheless, our squadrons continued to operate until, in the end, the use of aerodromes was virtually denied to them by constant enemy air attacks. In the concluding stages Blenheims attacked enemy columns advancing on the Larissa Plain, concentrating on road bridges between Kozani, Grevena and Kalabaka to impede the enemy's progress. One particularly successful attack was made when Blenheims bombed a large M.T. convoy concentrated in front of a broken bridge across the Aliakmon river a few miles from Kalabaka. Similarly, our fighters continued to engage formidable enemy formations with success. Throughout the campaign they had gained many victories against the numerically superior enemy, but at no time was their skill and high morale more in evidence than in the concluding stages. In a number of combats during the period of intensive enemy air activity on 19th and 20th April, Hurricanes of Nos. 33 and 80 Squadrons destroyed a total of twenty-nine German aircraft and probably destroyed another fifteen. In addition, Fighter Blenheims of No. 30 Squadron probably destroyed two Italian bombers. These successes were achieved with a loss of seven Hurricanes brought down and two damaged, a truly remarkable record in view of the increasing disparity of strength between the R.A.F. and the German Air Force.

At the beginning of these operations the combined strength of the German and Italian Air Forces amounted to approximately 1,100 aircraft, of which over 40 per cent. were fighters, a little less than 40 per cent. bombers and dive-bombers, and the remainder reconnaissance aircraft. The total strength of the R.A.F. in Greece with reserves was approximately 200 aircraft, of which about half were bombers. Although outnumbered, our squadrons operated with success in the initial stages of the German advance. It is probable that unfavourable weather and the lack of forward all-weather aerodromes at that stage prevented the enemy from making the best use of his superior numbers. As the enemy advanced, however, he was able to establish forward aerodromes, at first in the Salonika area and subsequently on the Larissa Plain, from which he was able to exploit his numerical superiority to the fullest advantage. He was thus able to concentrate an overwhelming force which took an increasing toll of our aircraft both on the ground and in the air. These casualties could not be replaced at that time from the slender reserves available in the Middle East, particularly in view of the dangerous situation which had arisen in the Western Desert. The odds which our squadrons had to face, therefore, increased disproportionately until the Germans had gained virtual air superiority. With that achieved they were able to concentrate the main weight of their attack against our troops, lines of communication, and ports. By 20th April our much-depleted squadrons were concentrated at the few remaining aerodromes in the Athens area, where, as already described, they were exposed to continuous air attack. With the complete collapse of the Greek resistance it became evident that even the shortened Thermopylae front could not be held against the superior weight of the enemy and the decision was made to withdraw all British forces to the coast and embark them for Crete or Egypt.

The scheme for the evacuation of R.A.F. personnel aimed at the removal of air crews and certain key personnel by air in squadron and transport aircraft and flying boats. The remainder were to be evacuated by sea with other British and Imperial Forces. Wellingtons of Nos. 37 and 38 Squadrons had already flown to Egypt on 17th and 18th April, the personnel and equipment following by sea on 23rd April. In addition, fourteen Blenheim Fighters of No. 30 Squadron flew to Crete on 18th April to provide convoy protection during the projected sea evacuation. The remaining aircraft of Nos. 11, 84, 113 and 211 (B) Squadrons and 208 (A.C.) Squadron, amounting to twenty-four Blenheims and four Lysanders, flew to Egypt on 22nd and 23rd April, the Blenheims having previously made several journeys between Greece and Crete evacuating air crews.

The enemy air attack on Argos on 23rd April, already referred to, had reduced the remaining strength of Nos. 33 and 80 Squadron Hurricanes to six. These and fourteen Gladiators of Nos. 80 and 112 Squadrons were flown to Crete on 23rd April to defend Suda Bay against enemy air attack and to take part with No. 30 Squadron in providing cover for sea convoys engaged in the evacuation. Sunderlands started to evacuate R.A.F. personnel on 19th April, when they flew a 30 Squadron party to Crete. The previous day they had also carried King Peter of Yugoslavia and other important political personages to Egypt, having taken them off from Kotor (Yugoslavia) on 17th April. Sunderlands continued the evacuation of essential personnel in stages from Greece to Crete, thence to Egypt. The King of Greece and members of the Greek Royal Family were included among other important passengers flown to Crete in Sunderlands on 22nd and 23rd April.

On 23rd April the Sunderlands were reinforced by two B.O.A.C. Flying Boats which operated between Crete and Egypt and rendered valuable service. These efforts were further augmented on the same day by Bombays of No. 216

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Squadron which took two parties from Eleusis to Bagush, and the following day by Lodestars of No. 267 Squadron which carried three parties from Argos to Bagush. Enemy air attacks rendered Eleusis and Menidi aerodromes unusable after 23rd April, and Argos similarly out of action from 24th April. The Bombays and Lodestars thereafter continued to carry personnel from Crete to Egypt. The last Sunderland loads to leave Scaramanga were taken off on 24th April and included Lieutenant-General Sir T. Blamey, C.B., C.M.G., D.S.O., and Air Vice-Marshal J. H. D'Albiac, D.S.O., and their respective staffs.

On 24th April 1,700 R.A.F. personnel were at Argos awaiting evacuation by sea but by the next day the majority of these had moved to Kalamata and Gytheon, three Sunderland loads being taken off from the former, and one from the latter and flown to Crete. Subsequently all personnel remaining there were evacuated by sea, many of them crossing in small boats to Kythera, whence they were later taken off in destroyers. Further Sunderland evacuations from Greece were made from Nauplia (Morea), transporting Prince Paul of Greece, the Greek Prime Minister and other important passengers including General Sir Maitland Wilson and Generals Mackay and Rankin.

Meanwhile flying boats of Nos. 228 and 230 Squadrons and landplanes continued the evacuation from Crete to Egypt, the last flight being made by a Sunderland on 2nd May. The total number of personnel evacuated by air from Greece to Crete was over 600, and from Crete and Greece to Egypt 870. Two Sunderlands were lost in these operations, one of which crashed while alighting by night at Kalamata, and the other was destroyed by enemy air action at Scaramanga.

The main evacuation from Greece of British and Imperial Forces was effected between 24th and 30th April in convoys of H.M. Ships and other vessels. All available aircraft operated in support to protect the convoys against the heavy enemy air attacks to which they were constantly subjected, and which were causing heavy losses. The forces available in Crete were fourteen fighter Blenheims of No. 30 Squadron, nine fighter Blenheims of No. 203 Squadron (recently sent to Crete from Egypt to take part in this operation) and the remaining six Hurricanes and fourteen Gladiators of Nos. 33, 80 and 112 Squadrons. At this stage, however, only six of the fourteen Gladiators were serviceable.

Blenheims usually operating in patrols of six aircraft provided such cover for convoys as was possible in the vicinity of the mainland of Greece, while Hurricanes and Gladiators provided patrols over convoys approaching Crete and during their disembarkation at Suda Bay. At the same time, Sunderlands provided Ionian and Mediterranean reconnaissances to guard against possible raids on our convoys by units of the Italian Navy.

During the six months' campaign in Greece our Squadrons contended throughout with numerically superior enemy air forces, emerging in the end with much credit although sadly depleted in strength. Our total aircraft losses amounted to 209, of which eighty-two had to be destroyed and abandoned by our own forces during the withdrawal and subsequent evacuation. Many of the latter had been damaged during enemy attacks on our aerodromes, and in normal circumstances might have been repaired. Our total losses of aircraft missing and in combat with the enemy were seventy-two.

As a comparison, the losses inflicted on the enemy totalled 259 aircraft destroyed and ninety-nine probably destroyed, with several others damaged. Of these, 231 were destroyed and ninety-four probably destroyed in combat with our aircraft.

Our personnel losses in Greece amounted to 148 killed and missing and fifteen taken prisoner. Of the total, 130 were aircrews. Such losses cannot be considered unduly heavy, bearing in mind the difficulties of the campaign and the hazards of the subsequent evacuation.

I cannot speak too highly of the work of Air Vice-Marshal J. H. D'Albiac, D.S.O., who commanded the British Air Force in Greece during the whole six months' campaign. His initiative, his personality and tact in dealings with the Greek High Command, enabled him, right up to the end, to obtain the maximum results in support of the Greeks from the small force at his disposal.

Of those under his command, the most outstanding for their valuable services were:

Group Captain A. H. Willets, Senior Air Staff Officer during the whole period.

Wing Commander P. B. Coote, who commanded the Western Wing (The Albanian Front) and himself took part in many of the fighter patrols and bombing raids of his squadrons, from the last of which he is missing.

Wing Commander J. R. Gordon-Finlayson, D.S.O., D.F.C., commanding No. 211 Squadron, and later the Eastern Wing. A fine leader and an inspiration to his squadron, with which he had completed over one hundred raids.

Squadron Leader E. G. Jones, D.F.C., commanding No. 80 (F) Squadron; his leadership maintained the high morale and efficiency of this squadron, whose six months' record in Greece, mostly in Gladiators, was quite remarkable.

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Wing Commander Lord Forbes, Intelligence Officer on the Staff, who carried out many special missions in his Q.6 aeroplane, some of which were of an unusual and hazardous nature.

Italian East African Campaign

The successful land operations against I.E.A., which resulted in the complete collapse of Italian resistance in that area except for a small "pocket" in the region of Gondar, were supported by air forces from Sudan, Aden and Kenya. In deciding on the actual strength of the air force required to give full support to the land forces operating from the north and south, it was necessary to take into account the fact that:

(i) It was still possible for the Italians, and Germans if they so decided, to send reinforcements of aircraft direct by air from Tripoli to I.E.A.

(ii) To meet the commitments in Libya and Greece the release of air and mechanized forces from this front was important. There was, therefore, need for speed if the campaign was to be completely successful before the rains started in April.

(iii) The majority of our aircraft were of obsolete or obsolescent type which needed the cover of a few modern fighters to enable them to operate by day in face of the Italian C.R.42 fighters which were still active until towards the close of the campaign.

(iv) Patriot activities required constant air support to maintain enthusiasm and morale.

(v) The Red Sea shipping route still remained potentially a very vulnerable line of communication. Its security was the more important since traffic through the Mediterranean had virtually ceased.

In the Sudan, at the beginning of the year the R.A.F. under Air Commodore L. H. Slatter, O.B.E., D.S.C., D.F.C., consisted of five squadrons and one flight. No. 1 South African Air Force (F) Squadron (Hurricanes and Gladiators), No. 237 Rhodesian (A.C.) Squadron (Hardys), No. 47 (B) Squadron (Wellesleys), No. 223 (B) Squadron (Wellesleys), and No. 14 (B) Squadron (Blenheim IV's). In addition, "K" Flight's (Gladiators) move to Egypt was cancelled *pro tem.* and they were retained in the Sudan. These squadrons were mainly used during the whole period to defeat the Italian Air Force and to support the advance of the Army into Eritrea. Other commitments which were met included the air defence of Port Sudan, occasional special convoy escort work in the Red Sea, attacks on the harbour of Massawa and support of the increasing activities of the Abyssinian Patriots farther south, Haile Selassie having entered Abyssinia on 20th January, 1941.

Pressure by General Platt's force on the Kassala area resulted in the fall of the town on 19th January and the retreat of the Italian forces into Eritrea. Steady progress by two parallel columns continued, Agordat and Barentu falling on 1st and 2nd February. Early in March the advance was halted in front of the formidable defences on the Keren heights. Here the Italians made a determined stand until 27th March, when they were forced to withdraw southward.

In these operations at Keren the R.A.F. played a prominent part in the close support of the Army. Wellesleys, Vincents, Lysanders, Gauntlets and Hardys were employed for continuous bombing of targets both in and behind the enemy's battle positions. Without doubt this heavy and continuous bombing, combined with the effect of artillery fire, seriously weakened Italian morale and contributed very largely to the capture of this formidable position.

Meanwhile, the offensive against enemy aerodromes, lines of communication and aircraft in the air was continued by Blenheims, Hurricanes and Gladiators. Enemy fighters, whose appearance became less frequent as time went on, continued to "shoot up" our aircraft on the ground, occasionally with success, but their air effort gradually dwindled until by the time Asmara was occupied on 31st March it had virtually ceased.

The Hurricanes of No. 1 South African Squadron were especially prominent in these operations. In two attacks on enemy aerodromes they destroyed six C.A. 133's, four C.R.42's and six S.79's, besides damaging a further three S.79's.

During the attack on Keren a particularly successful bombing attack on lines of communication resulted in the destruction of an ammunition train reported to be carrying over 20,000 shells.

Farther south, bombing attacks were made in support of the Patriots to help in sustaining their morale; Gubba, Gondar, Asosa, Burye and Debra Marcos being among the places attacked. Blenheims of the Free French Flight took part in these operations. Pilot Officer R. A. Collis, D.F.C., of No. 47 (B) Squadron (Wellesleys) made a series of nineteen flights up to a distance of 200 miles into Abyssinia, carrying at various times ammunition, money and supplies for the Patriot forces, and on other occasions representatives of the Emperor and Army Officers.

North of Lake Tana the Italians contrived to maintain themselves in the Gondar area, but south of the Lake the Patriots succeeded in capturing Burye and Debra Marcos and in reaching the Blue Nile.

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After the occupation of Asmara on 1st April the advance continued on Massawa. As our threat to that objective developed, five Italian destroyers based at Massawa left harbour in a northerly direction on 2nd April. This force was located and attacked on 3rd April by No. 14 Squadron (Blenheims) and No. 223 Squadron (Wellesleys). The Swordfish torpedoed two of the destroyers, sinking one of them and leaving the second in a sinking condition, the latter being subsequently bombed and sunk by a Blenheim. A further two destroyers were driven aground on the Hedjaz Coast some twelve miles south of Jedda, where they were bombed and destroyed by Blenheims and Wellesleys operating in conjunction with H.M.S. *Kingston*. The surviving destroyer escaped and returned to Massawa, where she scuttled herself.

Our troops occupied Massawa on 8th April. The capture of this Port, combined with the destruction of the enemy naval forces, greatly reduced the potential threat to our Red Sea communications.

The successful progress of the campaign, coupled with the almost complete destruction of the enemy air force on all fronts of Italian East Africa, now enabled the greater part of the squadrons previously contained in the Sudan to be released to other theatres. Thus, during the early part of April the remaining forces operating there were reduced to No. 47 (B) Squadron (Wellesleys), No. 237 (B) Squadron (Hardys, Lysanders and Gladiators) and the Free French Flight (Blenheims). Other units, consisting of No. 1 Squadron, S.A.A.F., No. 14 Squadron, No. 223 Squadron, "K" Flight and No. 1430 Flight were moved with what aircraft remained to them to Egypt where they arrived about the middle of April. Nos. 14 and 223 Squadrons took part in the action against enemy naval forces described below before their departure.

In the subsequent advance from Asmara towards Dessie the greater part of the offensive effort against objectives in the Dessie area was made by aircraft from Aden and East Africa. These operations are referred to later. Wellesleys of No. 47 Squadron and Gladiators, Lysanders and Hardys of No. 237 Squadron nevertheless made attacks on a light scale on objectives in the vicinity of Amba Alagi where our advance from the north was held up. Bombing and machine-gun attacks were made on enemy troops and M.T. at Mai Ceu, Alomata and Amba Alagi and on the aerodromes at Alomata, Cercer and Sifani. The scale of attack in this area was considerably increased after 27th April, when our column from the south captured Dessie, Nos. 47 and 237 Squadrons making over eighty bomber and fighter sorties on enemy positions around Amba Alagi between 28th April and 3rd May to break down the remaining resistance. The enemy was still holding out, however, at the end of the period under review, although the forces there, under the Duke D'Aosta, subsequently capitulated on 16th May.

Operations at Gondar and in the Lake Tana area were continued throughout this period, twenty-seven medium bomber sorties being made by Free French Flight Blenheims and Wellesleys of No. 47 Squadron, the former providing more than half the total effort. The main weight of this attack was against enemy positions and M.T. at Gondar, while other attacks were made on similar objectives at Bahr Dar South of Lake Tana, at Chelga, Gorgora and on the Gondar-Adowa Road.

It appeared likely at the end of this period that, with our troops held up in the Volchit Pass, Gondar would be the last serious military objective in Italian East Africa.

Great credit is due to the A.O.C., Air Commodore L. H. Slater, C.B.E., D.S.C., D.F.C., for his most efficient handling of the R.A.F. and for his excellent team-work with the Army. No praise can be too high for the pilots and aircrews for their accomplishments. Many were flying in obsolescent single engine aircraft. The country was difficult, and much of the flying had to be done at low heights over hostile positions. Great devotion to duty and a high standard of skill were needed to achieve success under these exacting conditions.

In Kenya, under the command of Air Commodore W. Sowrey, D.F.C., A.F.C., the Air Force consisted of six South African Squadrons and one Flight of Glenn Martins, No. 2 (F) Squadron (Furies and Gauntlets), No. 3 (F) Squadron (Hurricanes), No. 11 (B) Squadron (Battles), No. 12 (B) Squadron (Ju.86's), Nos. 40 and 41 (A.C.) Squadron (Hartebeests), a total of ninety-four aircraft all told.

During January the establishment of advanced landing-grounds was completed as far forward as possible on the fronts facing Abyssinia and Italian Somaliland. The advance of General Cunningham's Force started on 10th February and met with some opposition from Italian aircraft operating from Afmadu and Gobwen, but the destruction of seven C.A.133's and three C.R.42's in the first two days went a long way towards establishing the complete air superiority eventually achieved, and which, without doubt, affected the whole course of future operations.

On 11th February, Afmadu was captured and after a further rapid advance Kismayu was occupied on 14th February.

After the fall of Kismayu our aircraft assisted

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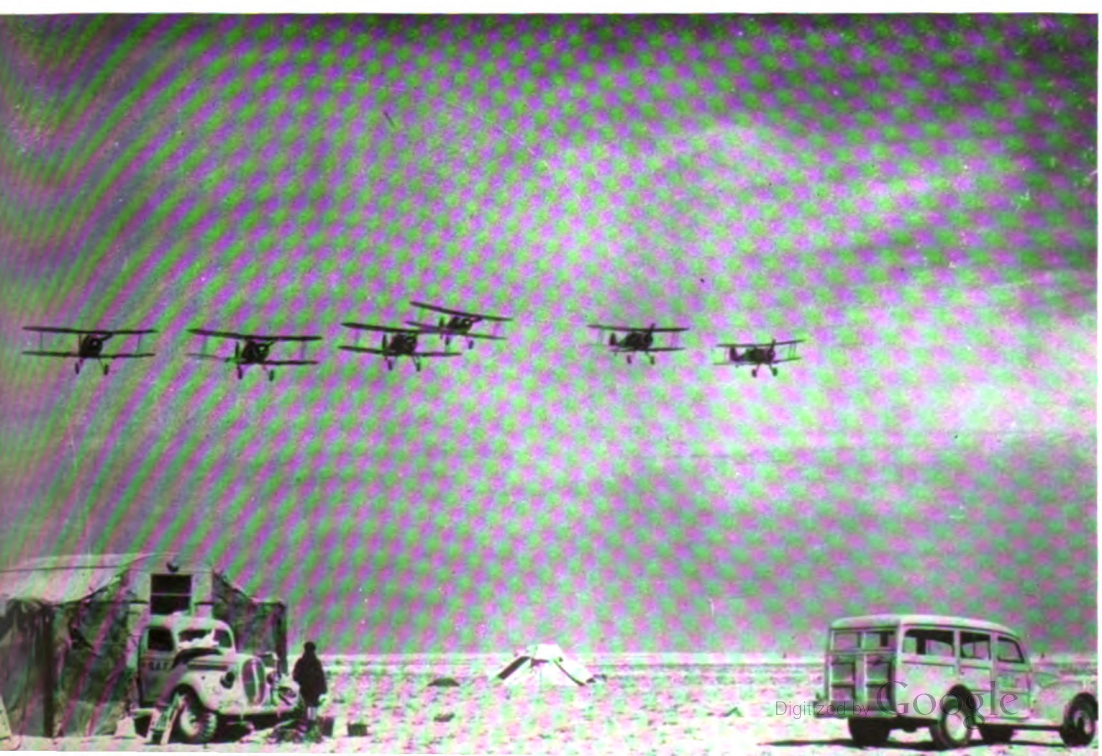
Havoc at Tobruk : captured enemy motor transport.

A Royal Australian Air Force Gladiator Squadron returning to its base after a fighter patrol guarding the advance on Bardia.



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The last phase at Bardia seen from the air. The huge mass of prisoners collected near the town.

Destruction of El Adem, the largest Italian aerodrome in Libya. Eighty-seven Italian aircraft were found destroyed when British Army Forces took possession.

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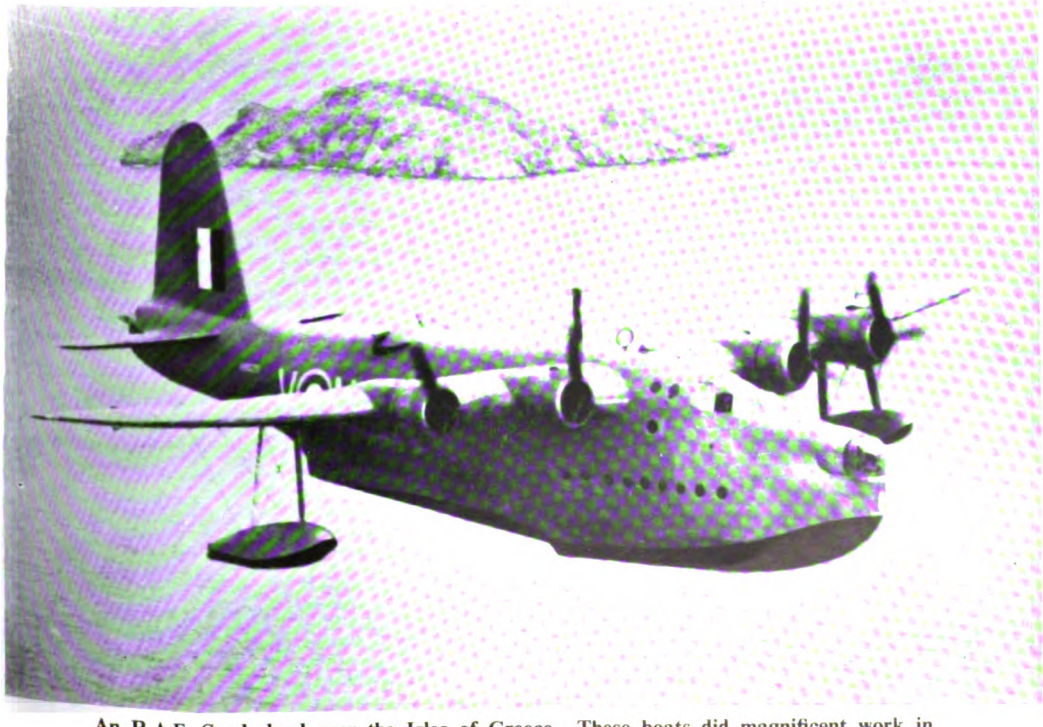
The first contingent of R.A.F. personnel land in Greece from a British warship.



An R.A.F. Sunderland over the Isles of Greece. These boats did magnificent work in support of these operations and in the final evacuation.

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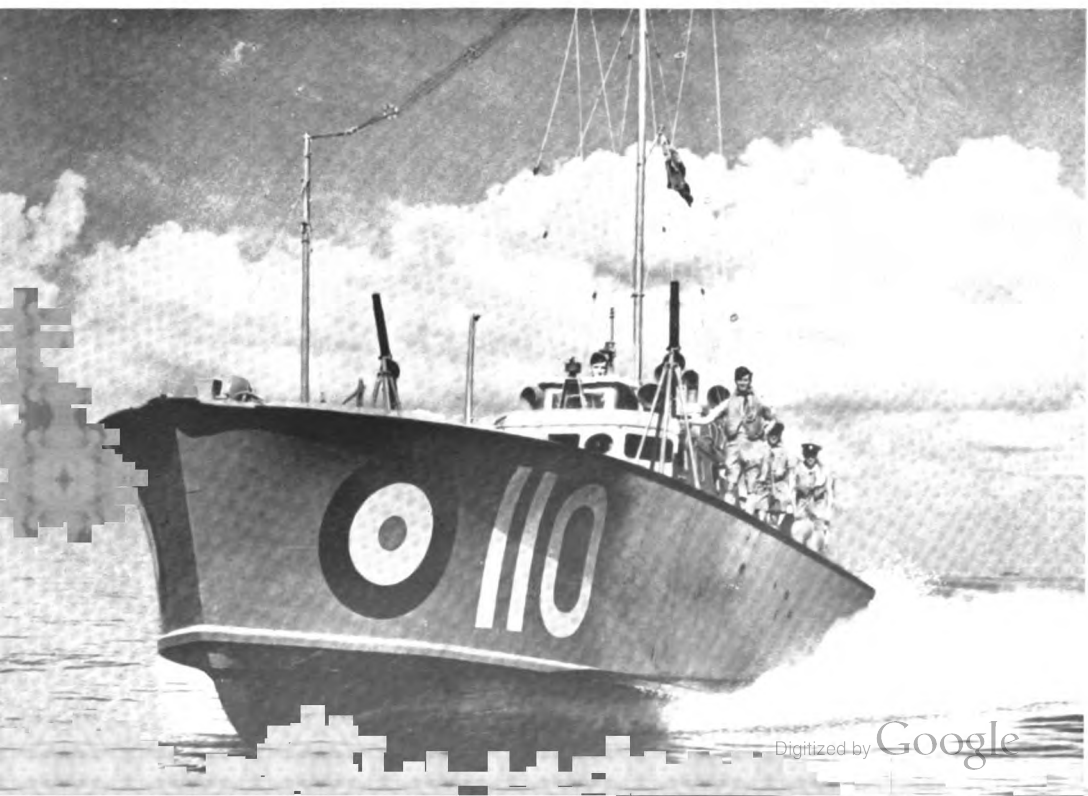
R.A.F. Armoured Cars played an important role in the defence of the Middle East.

R.A.F. speed launches on service in the Middle East saved enemy as well as British airmen forced down into the sea.



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the turning operations which resulted in the forcing of the River Juba and the dash on Mogadiscio. Gobwen, Afmadu, Jelib, Bardera and Dolo were among the targets attacked, also Ischia, Baidoa and Bur Agaba further north.

By the middle of March the forces had reached Gabredarre, having advanced 755 miles in thirty-nine days.

During the remaining operations in March against Harar and Diredawa intense air attacks were made on these places, on military targets in the Jijigga area and on the railway and stations of the Addis Ababa—Djibuti line. Direct hits by bombs were scored on several trains as well as on M.T. on the roads, and traffic was largely immobilized.

Hurricanes of No. 3 S.A.A.F. Squadron "ground-strafed" Diredawa aerodrome on 15th March, damaging two S.79's and five G.R.32's. Other enemy fighters were shot down in the air over Diredawa.

At this time enemy bombers made a number of attacks on our forward troops at Marda Pass near Jijigga, but did no damage.

On 28th and 30th March enemy fighters machine-gunned Jijigga aerodrome, damaging four of our aircraft on each occasion. Two of the raiders were shot down.

Glenn Martins of the S.A.A.F. did regular long-distance reconnaissances in the Addis Ababa direction. Farther south in the Boran area the rains set in early in March, hampering operations. Our bomber aircraft attacked enemy positions at Yavello, Neghelli, Moyale and Mega in support of the Army, and Neghelli was occupied in March. Thus, by the end of March, our forces were firmly established within the southern boundaries of Abyssinia and farther north were already threatening Addis Ababa along the railway.

On this front alone did the enemy show any activity in the air, but it was only spasmodic, and in no way hindered the advance of the Army.

After occupying Diredawa on 29th March our forces resumed their advance and after a brief check at Awah moved on to Addis Ababa which surrendered on 6th April. From Addis Ababa our forces advanced in three directions. One column moved north-east towards Dessie, a second column advanced north-west towards Debra Marcos to join forces with the Patriots, while a third column moved south-west on Gimma to engage the considerable enemy forces in the Galla Sidamo. In the Gojjam the Patriots achieved much success, capturing Debra Marcos, the principal town, on 7th April. By the end of this period the Gojjam was practically cleared of the enemy.

Squadrons of the S.A.A.F. continued to operate in support of our troops, their activities consisting largely of offensive reconnaissances during which bombing and machine-gun attacks, the latter chiefly by fighters, were made on various enemy objectives.

During the advance of our forces on Addis Ababa effective attacks were made on enemy positions and M.T. in the Awash area, and on the aerodrome at Addis Ababa where some of the few aircraft remaining to the enemy were concentrated.

With the advance of the three columns from Addis Ababa in diverging directions, air operations in support of our troops were continued over widely separated areas. The main military objective at this time was Dessie, which our troops were approaching from the north and south. The main effort of the S.A.A.F. at this stage was, therefore, against objectives in that area, bombing and machine-gun attacks being made by S.A.A.F. Battles, Ju.86's and Hurricanes on enemy troops and M.T., and against Combolcia (Dessie) aerodrome. Our forces advancing from the south captured Dessie on 26th April but the enemy still retained his positions at Amba Alagi, holding up our advance on Dessie from the north.

Operations by Nos. 40 and 41 Squadrons, S.A.A.F. (Hartebeests) and No. 11 Squadron S.A.A.F. (Battles), were carried out against widely scattered groups of the enemy in the Gojjam and the Lakes area and north-east of Yavello.

In the Galla Sidamo, operations were concentrated largely against the Gimma area where No. 41 Squadron (Hartebeests) and No. 3 Squadron (Hurricanes) attacked the aerodrome, enemy troops and M.T. Engagements with the enemy fighters were few at this time, but on 10th April a formation of No. 3 Squadron Hurricanes attacking Gimma aerodrome encountered two of the remaining enemy fighters and shot them down over their own aerodrome.

As was the case in the Sudan, the general success of the campaign in Italian East Africa enabled two squadrons to be released from the East African Command. No. 2 Squadron, S.A.A.F., and No. 14 Squadron, S.A.A.F., the latter subsequently renumbered No. 24 Squadron, were therefore transferred to Egypt during the latter part of April, where they awaited re-equipment.

The South African Air Force are to be congratulated on the important and successful part they played in this campaign. They were operating over difficult country and under conditions which tested their initiative, stamina and technical efficiency to the utmost. They contributed

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largely to the complete defeat of the Italian Air Force in I.E.A. and to the destruction of 300 aircraft, which is the estimated total of enemy aircraft destroyed on the ground or in the air in that theatre of war.

At Aden, under the command of Air Vice-Marshal G. R. M. Reid, C.B., D.S.O., M.C., there remained the following squadrons at the beginning of the year:

No. 8 (B) Squadron (Blenheims and Vincents), No. 203 (GR/L) Squadron (Blenheim IV's), and No. 94 (F) Squadron (Gladiators) (not complete).

Though the Italian Air Force was within easy striking distance of convoys passing up and down the Red Sea, they made no attempt to interfere with this line of communication, which was of vital importance to our forces in Egypt. Whilst they were still capable of such attacks it was necessary to provide Red Sea reconnaissance, and a certain degree of air protection both to convoys and to Aden. The principal effort, however, of these Aden squadrons during the period under review was in support of the campaigns from north and south into Abyssinia.

Repeated raids were made on Assab, Dessie, Diredawa, Addis Ababa, Alomata and Makalle. Besides damage to buildings, depots and repair shops, numbers of aircraft were destroyed on the ground in the course of these raids, eight S.A.133's being set on fire at Alomata in one raid by two Blenheims.

In support of the operations, which resulted in the recapture of Berbera by landings from the sea on 16th March, twenty-one sorties were made against Diredawa aerodrome, ten enemy aircraft being destroyed on the ground and eight others damaged. Offensive reconnaissances were also carried out to neutralize possible enemy air action.

In April, operations in support of the Army in Italian East Africa were carried out almost entirely in the Dessie area and on the Assab—Dessie Road. Blenheims made a number of successful attacks on M.T. concentrations and troops in these areas and, in addition, attacked the aerodromes at Combolcia (Dessie) and Macaaca (Assab). The scale of effort at this stage was not heavy, only thirty-one offensive sorties being made during the period, including a number of machine-gun attacks by No. 203 Squadron (Blenheims) engaged on offensive reconnaissances.

Prior to the action on 3rd April, already described, when four Italian destroyers were sunk or disabled, the considerable force of destroyers and other Italian naval units at Massawa was a constant threat to our Red Sea communications. Regular reconnaissances of Massawa, Dahlak Island and Assab and the Eritrean Coast were therefore maintained, and a constant check kept on the movements of Italian ships and naval units. After the occupation of Massawa on 8th April this threat was greatly reduced, since Assab was the only port then remaining to the enemy. Thereafter, operations in the Red Sea were largely confined to reconnaissances of the port.

The reduction of Red Sea reconnaissances, combined with the general success of the campaign in Italian East Africa, enabled No. 203 Squadron to be transferred to Egypt on 16th April, 1941.

MALTA

Early in January, the arrival of the German Air Force in Sicily and Southern Italy changed the situation at Malta very considerably. Whereas the Italian air effort against Malta had been half-hearted, the Germans made determined and persistent attacks on the Grand Harbour, aerodromes and flying-boat anchorages.

As these attacks by day, and later more frequently by night, became more numerous and intense, the defence of the island and of the aircraft base there became more difficult. Some of our aircraft were damaged on the ground, as also were hangars and buildings, although casualties to R.A.F. personnel were fortunately light.

At the beginning of January there were operating from Malta:

No. 261 (F) Squadron (Hurricanes), No. 228 (F/B) Squadron (Sunderlands), No. 431 G.R. Flight (Glenn Martins) and No. 148 (B) Squadron (Wellingtons).

The aircraft strength of these units varied, but seldom, if at any time, were they up to establishment. Moreover, repair and maintenance under conditions of constant bombing became extremely difficult. Flying boats at their moorings were particularly vulnerable. Also, a certain amount of congestion resulted at times on the aerodromes when reinforcing flights, which used Malta as a "stage post," arrived from England *en route* to Egypt. It was necessary to pass them on without delay in spite of enemy interference.

Under these circumstances I considered it advisable, after discussion with A.O.C. Malta, temporarily to reduce the number of aircraft based on the island. In deciding which units to retain, the needs of the Navy had to be considered as well as the requirements of local Fighter Defence. The spirit of the garrison and the morale of the Maltese reacted remarkably to the Hurricanes' successes in air combats over Malta. This was a most important consideration, and it was obvious that as many fighters as possible should operate whilst the "game" remained plentiful and enterprising.

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Next in importance came the reconnaissance of enemy ports, their approaches, and of the Eastern Mediterranean itself. The former was done by the Glenn Martins at Malta, within their limited capacity—there were seldom more than three serviceable. A P.R.U. (Photographic Reconnaissance Unit) Spitfire, which was at Malta for special photographic work, proved invaluable for this port reconnaissance, but after its loss, through a forced landing in Italy, no replacement was made available from home. The Sunderlands of Nos. 228 and 230 (F/B) Squadrons on their Ionian Sea and Eastern Mediterranean reconnaissances could still carry on from Alexandria and Suda Bay, and the work of the Wellington Squadron operating against objectives in Italy, Sicily and North Africa could still be done, though on a reduced scale by Wellingtons "on passage." Thus, No. 228 (F/B) Squadron returned to Alexandria and the Wellingtons of No. 148 (B) Squadron moved to Egypt, detachments being left behind to maintain such Sunderlands as occasionally used Malta, and the Wellingtons on passage to Egypt.

In spite of these reductions it was still found possible to operate "passage" Wellingtons occasionally from Malta. An especially successful attack was made on Catania aerodrome on the night of 15th/16th January, when thirty-five German aircraft which had recently arrived were reported to have been destroyed on the ground by nine Wellingtons.

The Glenn Martins of No. 431 G.R. Flight reconnoitred and photographed Sicilian and Italian Harbours and aerodromes as far north as Naples and Brindisi. They also searched the sea for enemy shipping between Malta, Tunis and Tripoli as well as the West Ionian Sea, supplementing the wider strategical reconnaissance of No. 228 Squadron.

During the period of our occupation of Cyrenaica, Tripoli had remained within range of Wellingtons and Blenheims operating from Benghazi area which reduced the calls on Malta in that direction. However, after the Italian-German counter-offensive in Cyrenaica, which led to our withdrawal to bases outside the range of Tripoli, it became essential to resume operations against that objective from Malta. A detachment of No. 148 Squadron (Wellingtons) was accordingly sent back to Malta during early April, and aircraft of this detachment made thirty-four night sorties against Tripoli between 13th/14th and 24th/25th April, dropping upwards of fifty tons of H.E. and incendiary bombs on harbour facilities and shipping with successful results. Fleet Air Arm Swordfish also made torpedo and bombing attacks on convoys off the Tunisian Coast and against shipping at Tripoli.

Towards the end of April, Malta was reinforced from home by Blenheims of No. 21 (B) Squadron which made two very effective attacks on enemy shipping. On 1st May, six Blenheims of this squadron bombed and obtained several direct hits on a destroyer and a merchant ship of 3,000 tons near the Kerkenna Islands off the Tunisian Coast. On the following day four Blenheims made another effective bombing attack on a convoy of Italian naval and merchant ships south-west of Malta, obtaining direct hits on a destroyer and three merchant ships.

During the whole period under review the enemy continued to make persistent and heavy scale air attacks at frequent intervals on the island. The enemy's main objectives appeared to be the Grand Harbour and naval dockyards, as well as the three aerodromes and flying-boat anchorage. Especially severe fighting took place over the island during the repeated dive-bombing attacks on the Grand Harbour and aerodromes on 16th, 18th and 19th January, and on the aircraft carrier H.M.S. *Illustrious*, and convoy ships which had arrived in the harbour on 10th January. The first attacks were recklessly pressed home, and the enemy suffered heavy losses from our fighters and A.A. Batteries. It is reckoned that between 10th and 19th January, 196 enemy aircraft were destroyed or damaged, including forty-four destroyed in two raids by Wellingtons on the Catania aerodrome.

Another heavy attack, this time mostly by night, took place over a period between 28th April and 1st May when nine enemy aircraft were destroyed and a "probable" six, for a loss of six Hurricanes.

It is noteworthy that once the German Air Force was established in Sicily, Italian bombers scarcely again appeared over Malta. C.R.42's continued to act as escorts and to make a few low machine-gun attacks, but the Germans clearly preferred escorts of their own Me.109's or 110's for their dive-bombers.

To deal with these attacks the number of Hurricanes of No. 261 Squadron was gradually increased to thirty-four aircraft, partly by reinforcement from the Middle East and partly as a result of operations by aircraft carriers from the Western Mediterranean, in which Hurricanes were "flown off" to Malta. In addition, pilots were double-banked to cope with the increased raids and larger number of enemy aircraft taking part in them. This squadron was in action almost every day and on many nights. Though losses of our own aircraft were serious, a fair proportion of pilots were saved.

At the end of the period under review, despite the enemy's persistent air effort, Malta could still be regarded as an effective air base for

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fighters for a limited offensive against enemy communications in the Mediterranean, and as a "stage post" for the reinforcing aircraft *en route* for Egypt. The damage done to buildings and hangars made conditions of life and work uncomfortable and repair work was difficult.

In spite of these drawbacks, the fact that operations had been carried on throughout this testing period is a great tribute to the spirit and determination of the pilots, aircrews and ground personnel under the very able direction of Air Vice-Marshal F. H. M. Maynard, A.F.C. Amongst those under his command who rendered valuable service during this period may be mentioned the Senior Air Staff Officer, Group Captain A. C. Sanderson, D.F.C., Group Captain R. G. Gardner, D.S.C., Wing Commander A. D. Messenger (Senior Signals Officer), Squadron Leader P. S. Foss (No. 148 Squadron) and Flying Officer A. Warburton, D.F.C., of the Glenn Martin Reconnaissance Unit.

Palestine and Trans Jordan

During the period covered by this Despatch there is little to record of the activities in this area. No further enemy raids took place on Haifa, or elsewhere. Aqir aerodrome was completed and opened early in the year. Gaza was developed and Lydda taken over as an R.A.F. Station. These aerodromes were prepared for and subsequently occupied by the Squadron personnel evacuated from Greece, for the purpose of re-forming and re-arming them.

Iraq

The political situation described in my previous Despatch continued to deteriorate, particularly after the *coup d'état* by Raschid Ali and the subsequent removal of the Regent Emir Abdulla Ali. We were at this period more than fully occupied in Greece and the Western Desert, and the only aircraft available in Iraq were those of No. 4 F.T.S. at Habbaniya and the Vincents of No. 244 Squadron at Shaibah. Towards the middle of April it became obvious that air reinforcements would be necessary. The training aircraft of No. 4 F.T.S. had as far as possible been placed on an operational footing, but it was not until 28th April that it was possible to spare some Wellingtons for Iraq. On that date ten Wellingtons of No. 37 Squadron flew to Habbaniya and ten Wellingtons of No. 70 Squadron to Shaibah, followed on 1st May by a detachment of No. 203 Squadron (Blenheims).

By this time a landing of British troops at Basra had been effected and ships with additional troops were nearing Basra. It was at this moment, on 30th April, that the Iraqis disclosed the result of their Axis intrigue by surrounding Habbaniya with a strong Iraqi force, including artillery.

Egypt

At the beginning of January the Fighter defence of Egypt consisted of No. 252 Fighter Wing under Group Captain C. B. S. Spackman, D.F.C., who had most ably improvised an organization which operated one squadron at Amriya and a Sector Headquarters at Helwan, controlling the defensive patrols of the two R.E.A.F. Fighter Squadrons at Almaza and Suez respectively. Information was provided by No. 256 A.M.E.S. Wing.

During January, as a result of minelaying attacks on the Suez Canal, it was decided to build up an organization, on the lines that had proved so successful in the United Kingdom. Nos. 252 and 256 Wings were amalgamated as the controlling authority, the sectors being at Amriya, Heliopolis, Fayid and Port Said. As an interim measure, a temporary sector was formed at Ismailia to deal with the Suez Canal zone.

In March I decided to re-form No. 202 Group, under Air Commodore T. W. Elmhirst, A.F.C., to co-ordinate all operational problems concerning the air defence of Egypt, and to co-operate with H.Q., B.T.E., on problems concerning A.A. artillery and searchlights.

Experience showed that communications in Egypt were so poor that it proved impossible to operate even three sectors efficiently from one controlling authority, and accordingly the decision was taken to divide the Delta into two by a line from Baltim through Mansura, thence approximately south-eastwards to the Gulf of Suez, and to form two separate Wings each with its own filter room. No. 250 Wing formed at Ismailia to control the sectors of Port Said and Fayid and be responsible for the defence of the Suez Canal zone and eastern portion of the Delta area. No. 252 Wing was then made responsible for the control of the sectors at Amriya and Heliopolis, and the defence of Alexandria, Cairo and the western portion of the Delta.

During the actual period of this report the enemy's effort against Alexandria, Suez, Port Said and the Canal, was small in comparison to his activities elsewhere considering the many important and tempting targets open to him. There were, however, two or three effective raids on the Suez Canal which resulted in its being closed for periods up to a week or ten days on account of mines. Only one attack was made on the Fleet Base at Alexandria, and it was not until later that attacks increased in intensity.

A Balloon Barrage was established at Alex-

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andria under the very able control of Squadron Leader G. M. Trundle, who commanded No. 971 Squadron.

Mention must be made of the work of No. 267 Communication Squadron, ably commanded by Wing Commander S. F. Wynne-Eyton, D.S.O., and of No. 216 Bomber Transport Squadron. Their respective functions involved long and frequent flights to all parts of Middle East Command, stretching from Libya to Kenya and from Greece to Takoradi. Frequent use was also made of the services of the British Overseas Airways Corporation on their regular air routes. Their efficiency and reliability was of great assistance in meeting the very heavy demands for air transport.

Health and Morale

The general health of the Command as a whole remained good during the period under review. This was especially noticeable during the advance in Libya and during the operations in Greece where climatic conditions were extremely hard. The morale of all ranks, especially flying crews, remained high throughout.

As recorded in my previous Despatch, credit is due to Air Commodore A. E. Panter, the Principal Medical Officer, and to his Deputy, Group Captain F. J. Murphy. Squadron Leader The Rev. F. D. Morley, continued his active interest in the welfare of the airmen.

Administration

The work of endeavouring to maintain the Squadrons throughout the Command with replacement aircraft, spare engines and equipment of all kinds, proved most difficult in the absence of regular supplies from home. Re-equipment with new aircraft of those squadrons using obsolescent types was in most cases seriously delayed. In spite of these handicaps, everything possible was done by the Air Officer in charge of Administration, Air Vice-Marshal A. C. Maund, C.B.E., D.S.O., within the means at his disposal.

Air Commodore F. L. Fay, M.C., the Chief Engineer, continued most successfully to press on with the construction of the new aerodromes and landing-grounds.

The ever-increasing financial problems were most ably handled by the Command Accountant, Group Captain T. H. Evans, O.B.E., and in connection with which Mr. C. W. Evans, my Financial Adviser, was of considerable assistance.

No praise can be too high for the work of the ground personnel, officers and men alike, who, in their various capacities, maintained the aircraft, usually under the most trying conditions; whether in the winter snow or slush on the Greek —Albanian Front, or the sand and heat of Aden, Egypt and the Sudan, their devotion to duty, cheerfulness, and faithful service remained the same. All maintenance units, repair and salvage organizations, worked to their utmost capacity to keep the squadrons supplied.

Air Staff

Air Marshal A. W. Tedder, C.B., whose arrival on 9th December, 1940, I recorded in my previous Despatch, gave me most valuable support at all times as Deputy Air Officer Commanding-in-Chief.

Amongst others who continued to function most efficiently under extremely high pressure conditions were Air Vice-Marshal R. M. Drummond, D.S.O., O.B.E., M.C., the Senior Air Staff Officer; Air Commodore H. E. P. Wigglesworth, D.S.C., Plans; Group Captain N. S. Paynter, Senior Intelligence Officer; Wing Commander C. Bray, Senior R.A.F. Press Officer; Wing Commander T. A. B. Parselle, Air Communications; Squadron Leader Sir Arthur Curtis, K.C.V.O., C.M.G., M.C., my personal Staff Officer. Great credit is also due to Group Captain W. E. G. Mann, D.F.C., the Senior Signals Officer, and all his staff, for the efficient signal organization which met each new increase with complete efficiency.

In reviewing the part played by the R.A.F. in the Middle East during the period of my Command (May, 1940 to May, 1941) the following is a summary of some interesting and prominent features worthy of being placed on record:

(*a*) The unexpected survival of Malta as an operational air base. It started without fighters: after one year of war it had fifty. It has continued to function as a link on the air reinforcing route to Egypt and as a base for bomber and reconnaissance squadrons.

(*b*) The security of the Red Sea shipping route and its comparative immunity from Italian bombers or submarines; a tribute to the Aden and Port Sudan Squadrons and no compliment to the Regia Aeronautica.

(*c*) The part which the occupation of territory plays on the Mediterranean Littoral, as elsewhere, in adding to or reducing the potential scale of air attack on ships at sea and on our Naval, Army and Air Bases. Instance the Dodecanese (later, of course, Greece and Crete), and particularly the North African Coast.

(*d*) In this respect, the advantage to the enemy of regaining Cyrenaica and the coastal strip of the territory between Tobruk and Sollum. In contrast, our difficulty in providing fighter defence to isolated Tobruk, and the disadvantage to our bombers and reconnaissance aircraft of the increased distance to enemy bases.

(*e*) The speed of advance by motorized or armoured forces after breaking resistance in

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breadth, and the importance of mobility of those R.A.F. Squadrons with short range aircraft which must operate at once from rapidly established forward landing-grounds if they are to keep pace with, and continue, effective support of the advanced ground forces. Instance the advance into Cyrenaica, December to February, and also General Cunningham's rapid drive into Abyssinia through Italian Somaliland.

(*f*) The losses in grounded aircraft sustained during a rapid withdrawal through aerodromes being overrun; also the difficulty experienced by squadrons in offering effective air resistance whilst the ground personnel are constantly on the move to the rear. Instance the Italian withdrawal in Cyrenaica, and later our own experience in Greece. It was, however, less marked in the case of our withdrawal from Cyrenaica in April.

(*g*) Finally, the importance of taking into account the "time lag factor" when accepting Air commitments beyond the immediate capacity of the existing force. The interval, which must inevitably lapse with long lines of communication between the date when a decision is taken at home to despatch aircraft from the United Kingdom, until the time they become operationally ready in the Middle East. Though this was considerably shortened by air deliveries in the case of long-range aircraft, and also by aircraft carrier reinforcing operations, the spares and ground equipment to maintain these aircraft must still come by sea.

In concluding this report, I must again pay tribute to the ready co-operation and support of the Naval C.-in-C., Admiral Sir Andrew Cunningham, G.C.B., D.S.O., and of General Sir Archibald Wavell, G.C.B., C.M.G., M.C., with whom it was my privilege at all times to work in the closest accord.

To His Excellency the Ambassador, Sir Miles Lampson, G.C.M.G., C.B., M.V.O., once again my thanks and gratitude for his unfailing help and support in dealings with the Egyptian Government.

ARTHUR M. LONGMORE,
Air Chief Marshal.

1*st November*, 1941.

False Gods

By W. G. Sheppard

No. 1—COPERNICUS

THE elaborate theory of Astronavigation, as everyone knows, failed when put to the test: many of our night bombers did *not* find their targets, and others succeeded only after much stooging round. Consequently we had to fall back on primitive types, known as Pathfinders, who have retained some of the instinct for finding their way about which is so marked in that collateral branch of the evolutionary tree which takes in the birds.

Much thought and ingenuity have gone into the theory; but as it is based on a fundamental fallacy its conclusions, not surprisingly, are erroneous. And it is all due to Copernicus, who would have us believe that the earth is round, that it rotates, and at the same time revolves round the sun. The lunatic asylums have produced many equally absurd theories, but Copernicus is unique in having sold his theory to the whole human race except one otherwise insignificant member.

The man-in-the-street thinks that it must be true because everybody believes it. If he knew a little more about the laws of evidence he would realize that what everyone believes is most likely to be wrong. Where there are two schools of thought, a theory is subject to the closest scrutiny by one side or the other, whereas general agreement means that it does not receive the same critical examination. The history of the Copernican theory itself provides a classical example of this. Before it was generally accepted, there was much argument as to what must be the logical consequences of the earth's rotation, and this proceeded largely by analogy. The only thing on which the two sides agreed was that, if a stone were dropped from the top of the mast of a ship in full sail, it would fall not at the foot of the mast but some distance towards the stern. And the one fact about which there was no argument proved to be not a fact at all! It occurred one day to some genius to drop a stone from the top of a fast-moving ship, when it was found that the stone *did* fall at the foot of the mast.

Let us consider first the alleged revolution of the earth about the sun. We know that all motion is relative, and the relative motion of earth and sun can equally well be described as the earth moving round the sun or the sun moving round the earth. There is no means of deciding whether one description has more significance than the other—or, at least, there was no means until 1887. In that year Michelson and Morley per-

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formed their famous experiment which would have measured the earth's velocity through space if it were moving as the Copernicans maintain. And the experiment showed: no movement at all!

This would have been conclusive for anyone of open mind, as the man of science is supposed to be. Copernicans, however, are quite uninfluenced by evidence: if facts do not fit their theory, so much the worse for the facts. They did not dispute the accuracy of the experiment, but tried to get round it by the fantastic hypothesis that the measuring instruments changed in length according to the direction in which they were pointing. The crowning touch to this hypothesis was given by Einstein's theory of relativity, which therefore needs a little consideration. Einstein is a very great mathematician and on his own ground therefore can bamboozle the lesser mathematicians. The number who even pretend to understand him completely can be counted on the fingers of one's hands. We have the absurd situation therefore that experiment shows the earth to be the fixed centre of the universe, and nobody believes it. It is all explained away by a theory which no one understands. The truth of the matter is, of course, that Einstein has brought off the greatest "leg pull" of all time.

So far as the shape of the earth is concerned, it would not have occurred to any of us to question that it was flat had we not been taught in our infancy that it was round. And how did our teachers know it was round? Because their teachers had told them so! And so on. The propagators of the illusion in the schools are generally the geography specialists; and, as is well known, the geography specialist is usually the man who has failed in some other subject.

The ridiculous, but seriously advanced, argument that we should fall off the edge of a flat earth can be disposed of in a few words. We only meet those who have *not* fallen off. There are in fact hundreds of cases yearly of people who disappear leaving no trace; and what happens to them is anyone's guess.

I have gone to some trouble to find from the experts what they really believe as to the shape of the earth. They told me first that it was a sphere; but on further questioning they explained that it is not exactly a sphere but rather an oblate spheriod—they had been talking down to my mental level. By persistence I found that it is not even an oblate spheroid exactly; it is a geoid. I have looked up "geoid" in the dictionary and find that it is "the shape of the earth." So now we know: the shape of the earth is the shape of the earth. I feel that most of us would have suspected this without bringing in the experts.

The serious "proofs" that the earth is round all depend upon the assumption that light travels in straight lines, when we all know that light is subject to gravitation. In fact the major observatories send expeditions to any place where there is a total eclipse of the sun in order to measure the curvature of light due to the sun's gravitational field. What the Bedford Level experiment measured, of course, was the concavity of light rays, not the convexity of the earth. A sketch will show at once why, as light rays "sag" slightly, the hull of a ship is lost to view while the mast is still visible.

The Copernicians' trump card, however, is the statement that vessels, by steering a constant course, eventually come back to the place from which they started; they have sailed round the (round) world. The answer is that (*a*) no vessel has ever kept on a constant course round the world, and (*b*) a constant course on a *flat* earth would bring the vessel back to its starting point. On a sheet of paper mark a point to represent the North Pole—it does not matter which North Pole, magnetic or any other, provided one is consistent throughout. The line joining the position of the vessel to the pole is always its north-south line. Suppose then that the vessel steers a course due west, for example. As soon as it moves from its original position the north-south line changes direction, and the vessel travelling always due west must constantly alter course. A sketch will readily show that it describes a circle with the pole as centre. Even the Copernicans realize that a constant course does not give the shortest distance between two points. They talk of rhumblines and great circles, and otherwise try to blind us with science, when there is the simple explanation that their rhumbline is really an arc of a circle, and the shortest distance between its extremities is the straight line.

It is wireless, however, which has finally demolished the round earth theory. The Copernicians quite rightly pointed out that, if the earth were round, wireless signals could not be received at any considerable distance. Then experience showed that wireless signals were in fact received all over the world. That, of course, is conclusive: the earth cannot be round. The Copernicians were not defeated however: they invented first the Heaviside layer, and later the Appleton layer. And they are prepared to invent any number of "layers" rather than recognize the obvious.

Copernicus, of course, cannot be blamed because others have elevated him to the status of a god. His was an ingenious theory worthy of investigation; and history's final verdict on Copernicus will, I think, be that he was a great man who has been unfortunate in his disciples.

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FLASHBACK —TO 1940

PART II

A PERSONAL DIARY

20th July, 1940

A DAY of high wind and showers. This afternoon—after far too good a lunch for war-time, it consisted of roast veal and rhubarb pudding—I had a mighty bonfire going in the garden. A roaring, crackling bonfire of hedge clippings and other burnable rubbish. Vast billows of smoke eddied and swirled in the blustering gale. I am afraid it put rather a smoke-screen across the neighbour's tennis court; can it have been for that reason they gave up the contest soon after I got to work? We may get a little ground cleared for vegetables.

Nothing much from Hitler in his Reichstag speech but the usual rodomontade. I always suspect a vein of at least emotional truth in his declaration that he wished for friendship with England. Like the Kaiser, he seems to have had a wish to be admired and regarded as important by the British. Temperamentally he wants to show off before the British rather than to destroy them. What he wanted, perhaps, was a complaisant Britain as a balance in world affairs; possibly as an amiable neutral in future conflicts with Russia—even with U.S.A. But that is not the role we see ourselves playing. If the Britain which the world has known, and has known itself for three centuries, is to vanish, it must vanish entire. The British conception is not a design which can be bent to a foreign purpose.

27th July, 1940

The week has passed quietly with no new military development. Income tax has been increased (8s. 6d. in the £) and other taxes imposed.

In other words, Britain has not been invaded.

ENGLAND IN THE GOOD OLD DAYS

28th July, 1940

Sunday. The weather this month, after the first week, has not maintained the standard of May and June, which gave us English summer at its loveliest and freshest. There has been a good deal of rain—cold, surly rain which makes summer taste like winter and makes one wish for a crackling fire in the evening to cheer up the room. But today, Sunday is back in its old colours of gold, green and blue.

In my mother's time we never thought of having fires in the living-rooms in the summer. Summer and winter were then two quite distinct seasons (as they are now in Government departments), each with its own routine. Winter was divided from summer by the domestic ritual known as spring cleaning—a mortification of which we were spared not the smallest inconvenience, for my mother was a ruthless spring cleaner and would have felt it a reproach upon her honour as a housewife to mitigate its severities by one flick of a duster. With a 'kerchief pinned over her head she led the maids and women in this spring festival of cleanliness, while my father and I suffered the acute discomforts of males in a house given over to dust sheets, step ladders, furniture polish, buckets and all the other disconcerting paraphernalia, with hasty meals in unfamiliar rooms and bunches of stair rods over which one tripped on the way to bed with an almighty clatter.

It was then that bare winter suddenly gave place to spring—or rather, chill spring formally gave place to summer. Thick winter curtains which had draped the windows were replaced by filmy white wreaths of Nottingham lace—caught in at the waist like the ladies of the period; heavy curtains hung on rings before doors, to shelter us from the winter draughts, were taken down. But most definite sign of all, the fireplaces in the living-rooms were, so to speak, closed for the summer. The grates were black-leaded, the brass fenders and fire-irons burnished; then ferns and other plants in pots were clustered in the fireplaces. From that day,

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Tobruk was captured on 21st January, 1941. The Italian Cruiser "San Georgio" badly damaged by R.A.F. bombs a year earlier is seen more severely damaged and set on fire in this later attack.

Blenheims of the Desert Air Force.

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An alert sounds at a Fighter Aerodrome in the Western Desert.

A flight of Hurricanes in the Western Desert.

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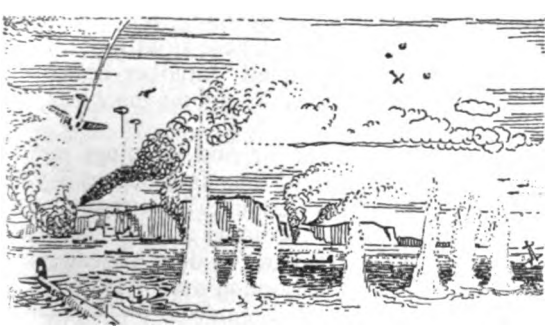
until some time about the end of September when the winter routine was restored, no one even thought of lighting a fire in a living-room, however cold or dismal it might be outside or within. It was summer, and in summer one did not have fires in living-rooms, as in winter one did not play cricket or go on picnics.

Modern inventions and amenities in the home have made us less aware of the seasons; we do not regulate our lives in accordance with their demands as our forebears had to do. Only occasionally during periods of exceptional cold —as last winter—when pipes freeze and lavatories cease to offer their hospitality do we get a reminder of what winter used to mean in England in the good old days.

Mounting German Air Losses

31st July, 1940

Thus ends July. Unscathed, we may reasonably feel that we are stronger than at the beginning of the month. Certainly, on the last day of June, I did not expect so quiet a month. It seemed that at any moment the Germans might make some heavy assault—if not an invasion, at least, intense air raids. Except for a number of air attacks on our shipping—convoys in the Channel and the Narrows—he has done little



in the air. An attack on Dover on Monday (or Sunday) morning seems to have been ineffective, and 18 planes were shot down out of 80 raiders in 30 minutes; 23 in all for the day. Well, we must see what August brings us—and Hitler.

Today has been a lovely day. July, 1940, is passing serenely into history.

10th August, 1940

War news of the week. Three Italian columns invade British Somaliland. So far we have let them invade. I do not know whether it is intended to offer a serious defence to Berbera. I know what one would like to see done; assemble sufficient squadrons from Egypt, Palestine and India—at Aden to give us local air supremacy. Then, at an opportune point, attack one enemy column from the air ruthlessly and continuously. All very easy in theory.

On Thursday the Germans attacked a convoy in the Channel, first with M.T.Bs., then from the air. Sixty German planes down; we lost 16 fighters and five ships, totalling 5,000 tons. Germans claim to have sunk 67,000 tons at the expense of two aircraft missing; their most fantastic claim to date, barring, perhaps, their naval claims to have sunk all our capital ships, some of them more than once.

11th August, 1940

At the 6 o'clock news we heard that 50 enemy aircraft had been destroyed today in attacks on the coast—our losses, 19. That is about 120 they have lost in the past few days; we have lost about 40 in the same period.

13th August, 1940

I have recently been reading, and writing a few notes upon, William Cobbett, the "Rural Rider." This morning I had to visit H.Q. Bomber, traversing, by a coincidence, the very road along which Cobbett jogged on his way home from High Wycombe to Uxbridge in June, 1822. Many of the same trees in the fields and woods by the roadside, I thought, met his eyes on that journey, slimmer and more youthful, no doubt, by a hundred years and more. But one spectacle the observant William did *not* see: the balloon barrage riding aloft over towards the Thames.

Since Sunday, air attacks on the Straits and South Coast have been maintained at high pressure. Each day, Sunday and Monday, we have shot down some 60 enemy machines, ourselves losing under a third that number. This sustained air offensive on our coast defences may be the prelude to Hitler's invasion. He will be hard put to, to keep up this weight of attack and this proportion of loss for long unless he sees some considerable advantage resulting.

People ask: Why has he given us this respite? Why did he not crash in on us immediately he had disposed of France, when we were ill-prepared and the B.E.F. an unorganized and ill-equipped body tumbled on the shores from Dunkirk? I will give what I guess to be the answer.

The Germans are a methodical people. They plan to the last detail. During last winter they worked out the summer campaign—against

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Norway, Denmark, Holland, Belgium and France. It was a bold and successful campaign. Perhaps it was more successful than had been expected—and had been calculated to last all the summer. Perhaps it was expected that the defeat of France and the presumed annihilation of the B.E.F. would end the war—Britain's collapse following that of Belgium and France. However, that may have been, I suspect that the situation reached when France capitulated in June, with Britain still at war, left the Germans at a loss. They had made no detailed plans beyond those for the conquest of the West European seaboard and the defeat of the Allied armies in Europe. Without plans, they could not extemporize so great and hazardous an operation as the invasion of Britain. Hence the delay.

The day after tomorrow is the day that Hitler was to have entered London. Unless he does it by parachute it looks as though he will have some difficulty in keeping his appointment.

14th August, 1940

Yesterday 78 German planes were destroyed. Our losses in fighters were 13, from which ten pilots are reported safe. We also lost 16 bombers in raids against the Germans. I hear that two of our stations, Detling and Eastchurch, received a packet; the former, just in process of transfer to our Command, seems to have been caught at a disadvantage.

Last night our long-distance bombers visited Italy and beat up Milan and Turin. It is cruel, perhaps, to relish the news of the poor Eyties getting a taste of the realities of war—in the supposed glories of which they have indulged their imaginations so excessively. But as a nation they, of all the combatants, have least reason to complain of war's buffets. As in 1915 they entered the war, unthreatened, for the sake of loot. If instead they get death, destruction and starvation—war's inseparable attendants—they have only themselves to blame.

15th August, 1940

I heard today that photographic air reconnaissance shows that the Germans are constructing numerous and heavy gun emplacements in the coastal areas around Calais. There is a supposition that he intends to lay a barrage over an area of the Straits of Dover and a small arc of the English coast. Magnetic minefields to north and south of the selected strip of narrow sea will temporarily keep our ships out. By these means an extent of sea and English coast will be "commanded" or "isolated," through which a crossing and a landing may be effected. Another suggestion is that the German guns are of immense range and that a persistent bombardment of the coast region—even of London—will be undertaken. I do not think much of this latter idea. No doubt bigger and better "Berthas" can be constructed, but it seems unlikely that any serious bombardment or barrage can be maintained at extreme range.

It has just been announced on the 6 o'clock news that up to 5 o'clock this afternoon, 55 enemy aircraft have been officially recorded as shot down. This, I think, is the highest number reached at the 6 o'clock news. Aerodromes are now being attacked—really a defensive action. Yesterday, 31 enemy aircraft were destroyed.

The belief that the next week or so will see a big-scale attack develop against Britain seems to be growing. It is reasonable to think that if they intend to attack they will not delay into the autumn.

It Can't Go On

16th August, 1940

Yesterday, 144 down; that was the score on the 8 o'clock news this morning, but this evening's final result is 169. I hear from our Intelligence that the "estimated" number destroyed is 250. Our losses were 34 fighter machines, 17 pilots saved.

We have had three air raid warnings in the past twenty-four hours; one just before 7 yesterday evening, one about 12.30 today, and another just after I got home and we were sitting down to tea. But no raiders appeared. It seems we get all the London area warnings.

As people say: "This can't go on."

17th August, 1940

Yesterday the raids were not so persistent or widespread. But a number of heavy attacks developed from midday until the evening. It seems that deliberate attacks were made on residential parts—in Eastbourne and in S.W. London. The Thames estuary and some south coast aerodromes (Gosport, according to the German wireless—I have not had a chance to confirm this) were bombed; 71 Germans shot down; our losses, if I remember correctly, were 12—with eight pilots saved.

No sign of any raids so far today. It is very hot and a perfectly clear blazing sky.

Last night I listened to some German radio

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propaganda. It seemed to be less good than usual. An attempt by an indubitable English woman to ridicule Dolfuss, a man the Nazis had brutally murdered, was, I think, a mistake.

Today in happier years, was the second day of the Foresters' match. How pleasantly the wickets would have gleamed—how bright the tents with their little flags waving, and gay the women's dresses in the deck chairs round the ground. On a hard, perfect Loughborough wicket I think I would have made a hundred, yesterday or today. Will that pleasant scene ever be re-enacted?

18th August, 1940.

Raids have been renewed today, but no news yet. We may hear something at 6 o'clock. We had a warning at about 1.15 in the middle of lunch. E. went off to her A.R.P. post and I served steamed apple pudding and custard in the centre passage, which we use as a "shelter" because it has no windows and no outside walls. The warning lasted half an hour or more. There go the sirens again—5.40 p.m. Off we go.

That lasted half an hour, after which I played ping-pong with M. The news said there had been strong attempts to raid London, which had been driven off. No figures yet of enemy losses; they may well be high, however, as the Boche seems to have been aiming to get inland. We have seen two squadrons of Hurricanes, and a few stray aircraft, returning from the north-east. No sound of bombs or anti-aircraft gunfire here.

Tomorrow week I am due for a week's leave; the first half of the fortnight we have all been told to take before November. Having nothing more in my thoughts to write at the moment, perhaps I should go with M. to water our winter cabbages.

22nd August, 1940

"Mass air raids" have faded out during the past few days. Churchill made a speech in the House yesterday which won general applause. At the moment our stock is high.

23rd August, 1940

Last night "the sound of the bomb brought us from our bed," though it had failed to wake me. Some minutes later—ten, I dare say—the sirens went. We dragged mattresses into our windowless inner passage. An aeroplane, or aeroplanes, could be heard at a height. After a while the "All Clear" went and I returned to bed, but the rest of the family slept out the night on their mattresses.

Today we hear that bombs fell at Harrow, destroying a cinema and damaging a bank. The Kodak works seem to have been the target, if there was a target. They were not hit. No one seems to have been killed.

German guns from the French coast have shelled Dover. Yesterday they shelled, without success, a convoy passing through the Straits.

24th August, 1940

Today I have started some leave—seven days plus a bit of the week-end. It is a delightful feeling. I rounded off my work this morning, gave final instructions, collected a few books and slipped out to my car at a quarter to one. It was a lovely morning, summery and shining and with a sparkle of autumn in the air. As I drove home a quite schoolboyish elation made itself—dimly, perhaps, but distinctly—felt.

Have finished Rose Macaulay's *And No Man's Wit*. A clever and brilliant bit of irregular writing; a sort of word picture of the passing pageant. An illustrated essay on Spanish and world political affairs with an oddly inserted fantasy of a mermaid's daughter.

Air raids, according to the news, have been on a bigger scale again today. We sat in the passage from 3.45 to 4.45 and had tea there during a warning. These warnings are growing tedious, but I suppose we should think ourselves lucky that they are not enlivened by bombs.

25th August, 1940

Sunday. Mass raids were renewed yesterday with, it seems, increased fighter protection. Manston has been damaged. Last night bombs were dropped on London. We had a warning about 11.30, before I had gone to sleep. A few minutes earlier I had heard heavy planes overhead. So far, 47 enemy down.

One of E's firemen friends went to Wealdstone to see the results of the bomb damage on Friday night. Came back shaking with laughter and describing the smashed cinema, holes in the road, etc., with immense relish.

29th August, 1940

There have been prolonged but not severe raids over the London area throughout the last three nights—beginning about 9 to 9.30 and lasting five or seven hours. Several bombs have been dropped within a few miles of here. One was a by no means bad shot for our H.Q.

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After one has heard bombs fall in the vicinity it is not altogether pleasant to lie in bed and listen to the heavy drone of the next enemy machine growing louder and more menacing as it heads in one's direction. It is difficult to remain altogether nonchalant and indifferent. I do not know whether one grows accustomed to this or whether it has a cumulative effect on one's nerves. Certainly disturbed nights and loss of sleep take the edge off one's vigour and alertness, though, so far, I have been lucky in not having to get up in the morning and sally forth to work.

There is something grotesque in the thought of Berlin families and London families crouching in their respective shelters while their respective Air Forces cruise about dropping high explosives on the heads of each other. Is there, in point of fact, much sense in it, taking the broad view?

1st September, 1940

The weather these past few days has been lovely. On Friday we went in the car to St. Margaret's, behind Hemel Hempstead. We had stayed some weeks in a cottage there when I came back from India. We found a spot to picnic, a place we knew, and gathered nearly two pounds of blackberries. I know no place where they grow so abundantly or so finely. While we were having tea we heard bombs exploding in the distance and a flight of Spitfires streaked across the sky. Soon came the drone of heavy machines and we saw in that wide, blue, open sky a batch of German bombers—six or eight—heading, I suppose, for the coast. Occasional bursts of machine-gun fire could be heard, but our fighters were invisible in the blue.

It was one of those early autumn days which come often at this time of the year; warm, sunny, but with a cool sparkle a sort of lively serenity. The corn stooks and the stubble give a golden quality to the country. It is the culmination of the year—the harvest.

Vicious Attacks on London

8th September, 1940

It has been a week of regular air raids—two or three a day, chiefly against south of England aerodromes and the outskirts of London, and scattered bombing at night. The enemy have been losing about 40 to 50 machines a day. In the meantime, we systematically bomb German and occupied territory every night. Berlin now comes regularly in the target area, and military objectives in the area have been pretty well plastered.

Yesterday, however, the Germans let loose a big attack on London. Waves of bombers and fighters swept in from the east and south-east at about 5 o'clock and there must have been considerable damage in East London and the docks, where big fires were started. All night the sky over London was lighted with an angry red glow—seeming more extensive, perhaps, on account of the ceiling of cloud. At 8.30 the raids began again and went on until 5 o'clock this morning. In a special announcement at 10.15 this morning, the first assessment of casualties was 400 killed and 1,300 or more seriously injured. Damage to warehouses along the river must have been heavy.

That is the sort of air raid we expected at the beginning of the war, and because they did not come we have, perhaps, grown to underestimate the effect of weighty mass bombing. There seems no reason to suppose that the Germans cannot persist in raids like this over a long period, and we must stand up to them and not let them interfere with our war effort. As long as the striking and defensive strength of the R.A.F. remains unimpaired and able to give blow for blow, the Germans cannot press this sort of attack to a decisive result; from that position, which we must hold this autumn, we must build up to air superiority. With our resources in Canada, and the U.S.A. as a source of supply, this should be attainable next summer. Barring unforeseen developments—America coming into the war, Russian complications, internal weakening in Germany (not one of which we ought to count on in our long-term plans)—that seems the only evident road to victory. And in the meantime, we must also hold Italy in the Mediterranean.

We have climbed back a fair distance up the precipitous slope down which we were knocked in June. That point, when France collapsed and worse, was the black hour. But we held instinctively, clinging for support in the darkness, to our native resolution and national traditions. Everyone expected an immediate and immense German assault on our resistance. Instead they held off; we had time to accustom ourselves to the new situation, to build up our defences and plan ahead. Then came the first air attacks and the great success of the R.A.F. fighters. One felt the long period of enemy success was ending—that he was up against a power he could not undermine or frighten, and did not quite know how to attack.

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Meanwhile, last week the American "deal" was completed; air and naval bases for 50 destroyers. The real importance of the "deal" is in its development of Anglo-American co-operation: the only real guarantee of future peace and the maintenance of our western democratic civilization. A combination between the British Empire and the U.S. would stabilize the world.

Rumania has virtually gone; Transylvania to Hungary, Carol abdicated and an Iron Guard dictatorship in power. Somehow it does not seem very important, for one cannot assess its influence, if any, on Russian-German relations.

Last week the weather was perfect. Last night, however, it blew up coolly from the west and I smelt rain.

15th September, 1940

Sunday. For three or four nights, beginning last Saturday, the Germans viciously bombed London. These were open assaults upon the civilian population. A thousand or more people have been killed, many thousands seriously injured. Houses and buildings of all kinds have been destroyed and damaged. Buckingham Palace has been hit by several bombs. For two nights—Saturday and Sunday—the skies over London were red with the reflection of fires.

A great deal of destruction must have been done; how much it is impossible to estimate; not enough, I believe, to affect seriously the functions of London as a capital city. As to the German attempt to terrify the people, to make them clamour against the Government and demand peace, I have seen and heard no evidence that any such result has been caused, or even that such bombings operate to turn people's minds in that direction. I can think of no instance where the bombing of cities has made the civilian population clamour for peace or has weakened the defending government. It was not so in Spain and it has not been so in China. There is no reason to suppose that it will be so in London; one would not, I think, expect it.

It will probably be shown that bombing of civilian populations has decisive effects only under certain conditions, as for example, where there is no effective defence or counter-attack, and when the bombed people have no hope of ultimate success.

One may note that the *threat* of air bombardment was decisive against Austria and Czechoslovakia; without it both these States might have at least put up a show of resistance; the Czechs, even after their defences had been taken from them at Munich. The threat of a destructive bombardment of defenceless cities no doubt did much to secure Hitler his "bloodless" victories. But against a courageous people resolutely at war, united, with forces capable of hitting back, bombing of the civilian population may well prove to be a useless form of frightfulness.

During the week I visited Pembroke Dock and Carew Cheriton. On the way back I broke my journey at Carmarthen and slept at the Ivy Bush. Here all was peaceful, and only the sight of soldiers in the town reminded one that a war was on. It was a change to sleep two successive nights without an air raid warning.

INVASION?

Invasion seems to be very much in the air; perhaps as a result of Churchill's speech on Wednesday (which I did not hear), perhaps because of a feeling that it must be now or never as far as this year is concerned. We are bombing their ports of assembly with regularity and persistence. It seems a difficult and hazardous task for Hitler to mount and execute an invasion of any weight while our naval and air forces are still intact and the Army and the nation are on their toes and straining to get at the enemy.

I shall not be surprised if there is no invasion this year. Hitler may decide to face the winter, aim to weaken us by air attacks and sea blockade and put everything into an assault in the spring. But need we then be weaker than we are now? Ought we not to be stronger?

16th September, 1940

In yesterday's day attacks we brought down 185 enemy aircraft—a record—against 25 of our own fighters lost, with 12 pilots saved. If the German aim was to test the strength of our air resistance after their weeks of assault, Goering can be left in no doubt of its vigour.

During the night there was a prolonged but not apparently a mass raid over the London area. Ack-ack fire was persistent and noisy at

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times, waking me up several times. Six bombs fell in the district, I learn, two of which, on Oxhey golf course, did not explode. I was awake and heard one coming down—an angry "swish-swish" spiral threshing of the air. I covered my ears for the burst as I lay in bed, but it was not as bad as all that. I decided, however, to withdraw to a mattress in the inner passage—comparative safety—where the family sleeps.

Today has been a cold, disagreeable day, with slanting rain. Almost the first really unpleasant day we have had since the summer began.

17th September, 1940

Today has been a high blustery day, sending the leaves spinning and the clouds tearing across the sky. Almost all the leaves have gone from one of my apple trees, and the apples hang bare and autumnally red. There is a rare freshness in these unharsh September gales. Would they could blow Hitler and his Nazi evil clean off this pleasant earth.

20th October, 1940

Sunday. What has been happening to the war during the past month? I suppose the virtual seizure and occupation of Rumania by Germany, and the German-Italian-Japanese Pact are the two chief incidents.

The question-marks now overhanging the war are: What will be Russia's ultimate line of reaction to Germany's penetration of the Balkans?; and, What set of conditions will bring the United States into the war? To the first of these questions no sort of answer can be given, except to say that for Russia to allow Germany unopposed to dominate and occupy the central and southern Balkans would seem to be a policy of suicide. To the second question there are three possible answers: If Japan extends her aggressive expansionist policy in the Far East beyond a point finally prejudicial to U.S. interests; if popular sentiment in the States propels the Administration into war on the general issues of save Democracy and save American *now;* if the point should ever be reached when it is apparent that only American intervention can save Britain.

Meanwhile, the bombing has proceeded without intermission and has become a regular and almost normal part of our lives. Except for those in and about London, it has become a nuisance rather than a terror. It is curious to find oneself, here in the heart of England, within a few miles of London, settling down comfortably in the evening, pulling one's chair up to the fire, lighting a pipe, opening a book with all the old relish of a winter evening, when all round the guns are barking and booming, bombs not infrequently crash and shake the window frames and the chug of enemy aircraft overhead is never long inaudible. Yet that is a literally true and exact picture.

Only when I am in bed and have to listen to the approaching grumble of the Nazi bombers, the bursts of gunfire, and *expect* the crash of a bomb do I find air raids disconcerting. Under such conditions, and even when one is half awake, half asleep and roused by a bomb-crump or the firing of a heavy gun, it becomes something of an ordeal, a little wearing to the nerves.

Evidence seems to be accumulating that an invasion of Britain was actually planned for 16th September, but was strangled at birth by the bombing of the invasion ports and the crowded transports waiting to push to sea, and perhaps, also, by the R.A.F.'s shattering of the mass daylight raid of 15th September. Rumour was strong at the time of a defeated invasion attempt.

Once again—as so often since I began to write these notes, usually at the week-end—it is a clear and lovely morning. The leaves have been tumbling fast these last days, but the general aspect as one looks over the country is still of leafage rather than of winter bareness—"bare ruined choirs where once the sweet birds sang." That has always been for me one of the most magically-potent and evocative of Shakespeare's lines. There were some pictures in the cloisters at school, illustrating, I believe, the four seasons, but of that I am not sure. One of them, at any rate, was a picture of a woodland winter scene, with the lines (printed in large Gothic characters):

"When yellow leaves or none or few do hang
Upon those boughs which shake against the cold,
Bare ruined choirs where late the sweet birds sang."

The words, combined perhaps with the picture, made a strong impression on my fourteen-year-old mind. I did not know the "yellow leaves or none or few" lines were Shakespeare, and it was with great delight that I found them, I suppose years afterwards, in the sonnets.

October is a richly satisfying month. Every month of the English year has its own peculiar

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quality of loveliness. May, December, September, golden serenity, each has its special glory. The glory of October is a richness, a warmth of falling leaves. Often, as this year, after a dry summer, the grass sprouts again and there is a minor brightness, a sort of "Indian spring."

"Odds Now Strongly in our Favour"

3rd November, 1940

One day last week—Tuesday, was it?—Italy attacked Greece. Or rather, delivered a three-hour ultimatum demanding what in effect was military occupation. The Greeks had the guts to resist, and it seems possible that this was a surprise to Mussolini, as up to the present his attack along the Albanian frontier has developed no real weight. But, perhaps, the Italians lack the true blitzkrieg spirit. We, of course, are helping Greece—and this may give us the chance to land Mussolini a few nasty blows by way of sea and air.

The German air attack on Britain has apparently lessened, in spite of a bomb uncomfortably near the bungalow a week ago, which made us duck quickly and wonder if all the windows had cracked (they hadn't). Mass day raids seem to have been abandoned, except on a small scale with fighter-bombers escorted by large numbers of fighters—an extravagant method having little success. At night, raids seem to tail off towards midnight. Certainly, things have been much easier. Why? Not, we may be sure, because Hitler likes us any better.

Adolf, one may suspect, has plenty of troubles to worry him. What is his real position now? The German army is sprawled across Europe, holding most of it in uneasy and loathed subjection. The first stunning effects of last summer's blows are beginning to wear off; the permanent suppression of half Europe is no longer just a victory parade. Can Hitler stabilize his conquered Europe in his so-called New Order? No, not—and here is the rub—while Britain stands undefeated and hostile, dominating and denying him the seas, striking with growing force from the air, encouraging and giving a focus point for every reviving patriotic aspiration in Norway, Denmark, Holland, Belgium, France, Poland, Czechoslovakia, Austria even. And who knows what dark suppressed impulses of hate may not begin to stir, to wake to life in this soil? How will Hitler fare in an atmosphere, not of loud triumph and bombast and victory, but in the sour air of disappointed hopes? That, I believe, is the crux of the present situation. Once more Hitler needs a triumph to inject into the German people, as a drug-addict needs at increasingly frequent intervals the stimulus of his dope. Where is it coming from? Mussolini?

One sees how in its broad outline this war begins to assume the pattern of the last. The Germans are held in the West—held at the limits of the coast, it is true, and after resounding victories and the subjugation of France—but held, nevertheless, in the sense that they have failed to achieve a final military decision. We hold the circling sea. The Germans use their masterful army to strike down every nation within their reach, as they did last time—Serbia, Rumania, Russia, Italy almost; today Rumania, hopefully Greece, perhaps next Spain. But where did it get Germany last time? Nowhere. It merely delays the end.

I believe now that the odds are strongly in our favour. The end may even be sudden and apocalyptic. My original date of September, 1941, is still worth considering.

U-Boats, as in 1917, remain our chief danger.

On Friday I went to London. The damage is less than one would expect, though windows have suffered. The houses round Regent's Park look ravaged and desolate, with yawning, empty frames. In one bombed shop was the notice, "Please enter by the door; Hitler came in through the window."

"Once More . . . in the Dark Hour News of a Naval Victory Lifts up our Hearts"

13th November, 1940

Wednesday. Have just heard on the 6 o'clock news of the smashing of the Italian battle-fleet in Taranto harbour. Could not keep exact count of what ships are submerged by the bows, beached, listing and what not, but it is evident that the line of battle strength of the fleet has been decisively impaired. This must materially affect the naval balance in the Mediterranean and have not only military but political results. Politically it must give Spain cause for careful thought, and increase Turkey's confidence. Even Japan, too—susceptible to the effects of this kind of exploit—may wonder whether after all the Axis is such a good insurance policy as it looked. As for the Greeks, it ought to delight them—and show that our promises of help have something solid behind them.

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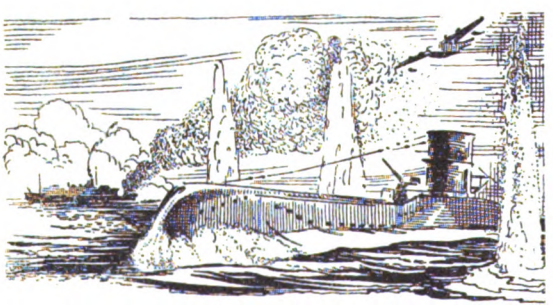
A grand piece of news. Once more, as so often in the 18th century and in the Napoleonic wars, in the dark hour, news of a naval victory lifts up our hearts.

17th November, 1940

Sunday. Once again a perfect morning; sun shining in a clean washed sky of palest blue; a slight breeze, but not enough to stir the winter branches of the trees, which seem to be glistening. Most of the leaves are down; only a few "yellow . . . do hang up those boughs . . . where late the sweet birds sang." The sweet birds still pop about in them, however: a lively, inquisitive jewel-eyed robin that makes his appearance as soon as I begin to saw logs, and the little colony of household sparrows that lodge in the trees before the front door, sitting often one to a branch, tucked up closely against the trunk. The fine old oak, now that he has lost all but a few dry tufts and plumes of leaves, is looking his age—a grand tree that has stood the weather and the years and the pruning woodman's saw for centuries and is ready to withstand 'em still.

Not much new in the war. There are suggestions in the papers that Germany is trying to establish factories and shipbuilding yards in Russia out of range of our bombers. There are also renewed "whispers" of a winter invasion. I have never felt that a winter invasion was out of the question, but I doubt whether the present murmurs are more than an attempt by Germany to discourage us from transferring more forces to the Mediterranean, where Italy is getting an uncomfortable pasting. The attack on our shipping from undersea and from the air—especially the long-distance bombing of ships out in the Atlantic—remains, in my opinion, the most serious danger we have to encounter.

During the week Coventry suffered a severe bombing attack, said to be a "reprisal" for a raid on Munich. The damage to the city seems to have been heavy and the cathedral is said to have been destroyed, though the spire still stands. There seems no reason why we should not alternately blot out each other's towns if so disposed. The point is that this kind of fantastic destruction follows naturally and inevitably from the doctrines and practice of Nazi-ism. It is the only alternative to submission to an oppressive and brutal domination; and the only thing which can sensibly be said—and I hope we shall go on saying it—is that bombing is better than servitude.



NEVILLE CHAMBERLAIN—A TRIBUTE

Neville Chamberlain is dead and his ashes have been placed in the Abbey. What can truly be said of him is that he sought to maintain peace in Europe. He tried to rationalize the dark racial passions and animosities, the national hatreds and ambitions which threatened us with the devastation of war. Perhaps in any other generation of statesmen he would have been successful, but with Hitler and his Nazis the very sincerity and impartiality of his efforts hastened their failure. It helped the willing conviction that the democracies would do anything to avoid war.

It is honest to say that among the influences which led to Munich and which prompted that hysterical scene in the House of Commons was that of the high-minded and noble aspirations of those who felt war to be a brutish and utterly foul thing, to be avoided at any cost. I believe that Neville Chamberlain was moved by those aspirations; he was in fact a civilized man. That is a tribute I think we should pay him.

"I MISTRUST THE JUDGMENT OF HISTORY"

18th November, 1940

We are often told that events "may safely be left to the judgment of history." Events must be left to the judgment of history whether we like it or not, but how this can be done "safely" is a doubtful point. Often enough, when we say that the reputation of this public character or the wisdom of that action can "safely be left to the judgment of history" we are really anticipating that judgment and pronouncing a favourable judgment of our own. The point is, however, that we assume that the judgment of history will be a just one—sounder, at any rate, than our own. I consider this to be a large assumption.

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After what period does contemporary opinion pass into historical judgment and become safe? What is the judgment of history on the Boer War, on the Bolshevik revolution, on the character of Marlborough, the justice of the cause of Charles I, the righteousness of the Reformation, the conduct of Drake in the Caribbean, the rights and wrongs of the Punic wars?

It seems to be taken for granted that "history" will always have at her disposal a fuller knowledge of the "facts," a clearer mind to perceive truth free from the distortions of partizan passion. Can this be taken for granted? Do we know more of events the farther we recede from them along the avenues of time? Does the man who with strong glasses from a high hill looks down on a little town spread out in the vale below so that the line and structure of every street is clearly visible to him—does he know more of the town than the people who live in it? No. There is such a thing, as Chesterton must have said, as being unable to see the trees for the wood. I mistrust the impartial judgment of history, for to be impartial and detached when all was heat and passion is like reconstructing a fire from its dead ashes, or a living, laughing face from the skeleton skull.

What will be the judgment of history on this war? Some things, no doubt, will be more clearly seen; the pattern will be more complete. But how much will be lost, gone with the winds of conflict. Even in 1937 it was difficult to explain the Treaty of Versailles to young men. No doubt to them their view seemed clearer, more impartial, nearer the truth than mine. But how could they hope to pass a judgment on that event who had not lived through the stress and agonies of the war years—to whom its brutalities and griefs and the broken hopes of young men and girls and the shattered lives of bereaved parents meant nothing? No, I mistrust the judgments of history.

Acute Discomfort of the Braggadocio Musso.

24th November, 1940

Sunday. It is now clear that the Italian attack on Greece has been completely defeated and that the Greeks, hitting back on the offensive, have smashed the frontier armies opposing them and whatever reserves the Italians could bring into the fight. The capture of Koritza and the puncturing of the Italian front in the centre sector would seem to make any immediate Italian recovery impossible as far as the forces now engaged are concerned. Keeping in perspective the size of this war, it is a substantial military defeat for the Italians. But more important than that, it is an abrupt and humiliating blow to the prestige of Mussolini. Quite suddenly all the boasts and braggadocio of Fascist Italy during the past ten years and more are seen to be ridiculous. The Italians do not possess the sort of reputation for military achievement that can easily brush off this kind of reverse. The Axis dictators can do their stuff when they are riding the triumphant high horse; how does one of them behave now that he has been sent sprawling in the mud?

One must keep in mind that if the Axis powers choose to exert their full strength in this small war they can smash through and overrun the Greek mainland. But is it in accordance with their interests to develop something like a major front in the South Balkans? May not this lead to complications—perhaps to resistance by Yugoslavia, the active entry of Turkey into the war, grit in the machine of Russian complicity? I cannot see that the Greek adventure is working out along the right lines from the viewpoint of long-range Axis strategy.

Meanwhile, from the military angle, it seems a great opportunity for us to "chivvy" Mussolini while he is on the run. To bomb and machine-gun his retreating troops in the narrow roads and valleys of Albania seems a golden opportunity for John D'Albiac—who, I see, is commanding the R.A.F. in Greece. *Prima facie* it looks the sort of situation an Air Force dreams of, and which optimistic instructors visualize and love to demonstrate in Staff College lectures. Of course, there may be—there usually are—practical obstacles. We may not have the aircraft on the spot; our bases may not be near enough to the front to supply a sustained attack from the air.

Mussolini's position in his coveted Mediterranean must be causing him acute discomfort.

"... Sets one up for the Day"

Every morning, in the early light, a bird—a missel thrush or a song thrush, I am not sure which—sings most sweetly in my garden. I hear it as I am dressing, and its unruffled water-clear notes in the November morning give one, somehow, a wiser outlook. The evils of our time, which seem omnipresent and all-pervading, shrink to a slighter proportion in the uni-

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versal scene. One morning a robin joined in for a few moments, and with sparrows chirping there was quite a choir of bird song.

This sort of thing cleanses one's mind and sets one up for the day.

"Caning . . . Undignified, Pathetically Foolish"

Again it is a lovely morning. My recordings of "lovely Sunday mornings" since I began to write these notes last May have become monotonous, and if they continue will seem absurd. At school M. appears to be full of *joie de vivre* and to be developing an interest in biology. They are doing "reproduction," taking as their example the rabbit. A just choice, one feels.

He says there is a good deal of caning at school; it is almost the only punishment. That, I think, is a pity. I am not against "corporal" punishment for appropriate misdemeanours, but to use the cane even lightly to inflict physical pain for trifling offences and for failure to do well in work is in my opinion a survival from an unenlightened age of education. We are barbaric enough in all conscience in many ways, but this—our treatment of children—is one field in which we have become more civilized and understanding even in my own lifetime. "Boys prefer to be caned," I can hear a headmaster's wife saying, "rather than to have to write lines." Maybe. Maybe, as the enthusiasts used to say, foxes enjoy being hunted.

I would not lay great stress on this, but in my view it shows one of two things: a confession of disciplinary incompetence or a misunderstanding of the sensible relationship between masters and boys at school. If I were a headmaster I should prohibit caning except for the capital crimes of the school calendar. I feel that the practice is silly and, for an adult schoolmaster, undignified. I do not believe that schoolmasters as a race will ever come to be regarded quite as the co-equals of other men while they are required and consent to keep up this rather pathetically foolish habit.

The Glittering Prince and his More Modest Attendant

30th November, 1940

Saturday. This has been a jewel of a day. I have watched the changing phases of its course. At dawn there was a sharp white frost and a white smoky mist in all the air and particularly in the valley. When I set off the sun was beginning to illuminate the mist and make it glow slightly, but on my way it still lay thick in the dips of the road.

During the morning the sun took control and shone from a white-blue winter sky. There was a sparkle in the air. Early in the afternoon little wavelets of white cloud spread across the sky for an hour or so, but towards evening they melted, except for a few streaks across the horizon. The sun went down magnificently, a clear-cut red orb of superb rotundity, alive with light but sharply rimmed against the paler background.

There was little wind all day. Chimney smoke floated from the houses on the opposite hillside. Mists began to creep up again and take possession of the night. There ought to have been the rich, satisfying smell of November twitch-fires—but twitch-fires, I suppose, must like everything else be out before the blackout. I smelt their ghosts in the closing dusk.

There are two stars which I have noticed since air raids made the night sky an object of regular attention. They rise in the east, one large and brilliant, one small. They are in this relation to themselves and the horizon—

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*

—and in that juxtaposition they mount and follow the sun's track across the sky. Strange that all my life I never noticed them before, for their appearance is striking and unmistakable. They must be known by their names, but I am carelessly ignorant of the nomenclature and patterns of the stars. This constellation, the glittering prince and his more modest attendant keeping always at a respectful distance, yet always within call, were rising in a cloudless but mist-shrouded sky as I took my last look at November, 1940. Thus another month passes, silently but not unadorned, into the quiet region of past time.

Days that are Unexampled and Perfect Jewels

1st December, 1940

Sunday. Anyone reading these notes must notice how often I mention the weather and seem to find it a subject of perpetual interest. Well, I do. It gives its own quality, its own particular atmosphere to every day and every scene. It has innumerable varieties, and most of them are familiar. Often I get a whiff of weather, a breath, so to say, on my cheek, which takes me back to some bygone moment altogether forgotten, its scene and circumstance altogether erased from memory except for that

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flickering weather impression now, suddenly. It is difficult to describe these fugitive sensations without becoming unduly portentous or *precious* or whatever the fault may be called. The truth is that I am extremely sensitive to weather and nearly always aware of it as an important part of the day. I could talk about it as a subject of genuine and lively interest, and not as a conversational stop-gap. Some times I begin to do so, and then perceive it is a mistake.

I am much in agreement with Charles II, who spoke affectionately of the English climate, observing that he knew no other country where, the year round, a man might spend more days out of doors. I dare say there are regions of the world discovered sinces Charles's time—Tasmania, New Zealand and other lands —which make this not altogether true, but it is a just observation. There are in point of fact very few days in this country in which a man, fortified with no more than a mackintosh or overcoat, muffler and stout boots cannot walk five miles or more without discomfort. And I would say that there are few if any countries of the world in which, doing this every day, he would meet with wider varieties and sub-tones of weather. One thing I would venture: that England can give us days that are unexampled and perfect jewels of their kind, taken, too, from all the months of the year—days which have a richness or a loveliness, a fragrance or a clear intensity that are the very quintessential beauty of their season. Brought together into a garland, no country or clime of either hemisphere can rival them. That much I would say for the abused climate of England.

I do not pretend that the English climate is universally agreeable, and in fact I think that a universally agreeable climate is no climate at all; but there are few of its aspects that I do not find in some way attractive. Perhaps the worst sort of weather we get is a wet and cold spell that too often ruins our summer; but it may be that I dislike this and am blind to its peculiar charms (if any) because it plays havoc with the cricket season. Rain, when it is time to play cricket, is an unforgivable crime against nature. And yet cricket without it—as in India and I suppose even in Australia—is not quite the same rich, turfy game it is at home. In these countries of almost unbroken sun it seems —so, at least, my Indian experience suggests— that the game (like the wickets) is ironed out.

I have written about weather and so have not much time this morning to consider the more ephemeral and less pleasant subject of the war. There is not, however, a great deal to say. The Greeks continue to snap at Mussolini's heels and press his beaten armies back through the Albanian mountains. From the air and sea we join in, and one cannot believe that Italy is enjoying her war as much now as when she first drew the dagger and stooped over the prostrate body of France last June. Now she is less perhaps a contemptible figure on the stage.

One wonders whether Germany really cares what Italy suffers—whether Hitler might not let her go, or almost so, as an encumbrance and, with her fantastic claims against France an obstacle to the outward establishment of his "New Order." Probably not, owing to the inevitable reactions in the Mediterranean and throughout the French Empire, and the lightening of our burden if Italy were to all intents and purposes put out of the war.

. . . . . .

Let me conclude with the briefest of notes on this day, 1st December. It has been something like yesterday, but decidedly wintry; the frost has taken one step forward. About sunset the sky and the atmosphere cleared, and there was visible the slenderest sliver of a new moon. As the sun went down a flood of salmon-pink spread over the western sky, the colour, it occurred to me, of the breast of a male stickleback in the full ardour of the spring.

In the last light the silhouette of a little wren sprang, teasing and scolding and answering her mate, from the branches of the rose arbour.

8th December, 1940

Sunday. One feels that the war has reached one of those stages at which its future direction is being decided. The Germans still, as the phrase goes, "hold the initiative," that is to say, the future direction of the war still depends mainly on their decisions; but perhaps events, and the shadows of events, are beginning to impose some limits on their choice and to give an uncomfortable urgency to their planning.

I still hold the view that the downfall of France was so sudden and so complete that it left the Germans without a plan. To the Germans a plan, precise in detail and devised to fit variable contingencies, is essential. (We seem to regard them as less important—inevitable, no doubt, as rather tiresome formalities, but really not of the first moment.) Their first jubilant reaction was that the war was won and over; that Britain must now follow France's lead and pack up — not quite so ignominiously, maybe, and with a pretence of negotiated terms and continued independence — that

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Europe was at Germany's mercy and the first step to world domination successfully and safely made.

Then it became apparent that this was not so. Britain, instead of collapsing, rallied and by a tremendous spiritual effort presented an even more resolute face of opposition to the triumphing Germans as they took up their stations across the Channel. At first, this may have irritated more than it perturbed Hitler. Then he began to see that it was real, a national movement and not a despairing show of Government bluff and propaganda. It had to be reckoned with; a new military plan had to be extemporized.

We do not know exactly what this plan came to be; perhaps it was lacking in the customary thoroughness and clarity of objective; counsels may have been divided. Certainly, however, it comprised smashing mass formation air attacks on Britain with the intention of destroying our air resistance and reducing the R.A.F. to relative impotence, and almost certainly it included a seaborne invasion of the British Isles. How near we were to such an invasion is not yet known—at least, publicly.

This plan was upset when the mass daylight air attacks failed; not only failed of success, but were accompanied by such disastrous losses as to constitute a serious defeat. The R.A.F.'s superiority over the British Isles and surrounding seas was clearly shown; its strength was found to be for the present, and within the limits of the immediate contest, unbreakable.

The Race of the Baffled Monomaniac

At this point came a modification in the plan —or it may always have been one of its contingent variations—namely, the mass night bombing assaults on London. The precise objects of these raids we do not know; they may have been two-fold, to break the moral resistance of the civilian population so that they would force the Government to make peace, and to dislocate public services, communications, etc., and so prepare another way for invasion. There may even have been an element of sheer Hitlerian malevolence, the rage of the baffled monomaniac, in these attacks on London. Whatever the objects, it became clear that they were not attained. Autumn came and drifted into winter without the Nazis having solved the problem presented to them by Britain's continued resistance after the fall of France.

But during this period other events had taken place behind the fury of the air *blitzkrieg*. America, after the first shock of France's defeat and the feeling that all was over, rallied strongly to the support of Britain as it became clear that we were determined to resist and had enough strength and resolution left to be worth backing. Germany could no longer rely with certainty that in a long war America would remain out to the end, if that end should again begin to look like a defeat for Britain. In an attempt to counter this danger came the so far not very effectual Three-Power Pact, which brought Japan into the Axis with Germany and Italy. Another move was an attempt to come to terms with France—still, apparently, in progress. Behind all this again was the attempt to erect the so-called "New Order," to include as many European countries as possible in a sort of higher diplomatic *fait accompli*, and at the same time come to a new (or prolong the old) agreement with Russia.

But of the inner promptings, aims and causes of these events, we can only guess. It is, however, certain that up to June of this year the German plans unfolded themselves with certainty and power; since that time they have shown neither of these characteristics. Their activities, on the other hand, have given an impression of uncertainty, anxiety, hasty improvisation and lack of a clear sense of direction. What from all this will emerge is perhaps now taking shape in the Nazi Councils. We ought to expect that by next March or April at latest the Nazi indecision will have vanished and that a new plan, furbished and burnished at all points, will appear on the European battleground. We must be ready for it.

Whilst we must never count or rely on it, we should always remember that behind all the Nazi show of power may lurk difficulties, dangers and fears which to us are only half apparent. How do the internal conditions of Germany look to the Nazi rulers? How tough, how ready to endure disappointment and hope deferred is the morale of the German people? What is in the mind of the inscrutable Russian? This last must be a constant anxiety to Hitler. It is crystal clear that a complete German victory leaving Russia sandwiched between the triumphant and militant Nazis, soon looking for fresh fields to conquer, and an ambitious and hostile Japan, is of all things, from the Russian point of view, the least desirable. How then, and at what time, will Stalin move to extricate himself from such a danger, if it should loom too near? It must be seen that the continued existence of the Western Powers as

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a military factor is essential to the safety of Russia. How then must Russia act in her own interest and for her own preservation?

No one knows. No doubt Russia feels herself to be militarily weak and will go to great lengths to avoid conflict with Germany at present. But have these great lengths no limit in complacency? It seems unlikely. Russia must certainly be a headache for Hitler.

Historic Fabric of English Life

What about Britain while all this has been going on? We can now recognize that in the summer of this year came a wonderful and historic uprising of the British spirit. It seemed to stir—oddly and uncharacteristically enough, one must say—on the last Sunday in May when there was a "National Day of Prayer," and it glowed like a light at Dunkirk. It withstood the military disaster of the French collapse and the anxious, uncertain days that followed. It expressed itself in the intense efforts of the workers to replace the material and equipment lost by the Expeditionary Force, and later in the superb fighting valour of the R.A.F. in August and September. But essentially it was a movement of the national spirit; a fusing of individual wills in the will of the nation. Suddenly, ordinary people saw the things they valued, and the things they loved, to be in jeopardy, in danger of savage destruction. Their instinctive response, I think, was, "We will die, if need be, but we will not betray or surrender those things which our ancestors made and bequeathed to us." There was a singular sense of unity, not only as between individuals but as between the present and the past; a feeling that it had fallen to our generation to defend not ourselves but the historic fabric of English life.

Nothing of this kind was ever in my sight or hearing expressed by word or sign. If I were asked how I know it, I would answer that that was how I was feeling and I was conscious of being in unison with my fellow-countrymen; moving with a strong mounting current. It was altogether an accident that I happened to be moved to write down some of this at the time—not very coherently, I am afraid, but still, I am rather surprised to find, with a certain authenticity. I suspect that many people, if they were to read the notes I wrote last June and July, however much they might deplore my way of expressing myself, would, nevertheless, say: "Yes, one did feel rather like that."

When I look back now at those days I am aware of one odd thing. Having (like many other people, and it required no second sight) having predicted the date of the outbreak of war with chance accuracy, some persons I knew placed a quite false importance on my opinion on other events, so that quite often I was asked (it was a not uncommon question): "But *how* are we going to win the war?" The curious thing is that at the time this seemed almost an irrelevant question. The really important thing was not how or even whether we should win the war—but (I found) that we should not give way, not surrender for destruction our British name and reputation to save ourselves or for lack of courage and endurance to resist to the end. It was not material defeat but spiritual defeat which seemed fearful and shameful. So the real answer—though not perhaps a very helpful one to those who had another (and quite legitimate) meaning in their minds—the real answer to the question: "*How* are we going to win the war?" was: "Why, simply by going on fighting it."

And it is because I believe that as a nation we are spiritually stronger—more enduring, that is, in the quality of our national spirit—than the Germans that I believe we shall win this war.

I have certainly misread the world we live in if braggadocio and boasting and the indulgence in romantic self-magnification, which are so big a part of Nazism and Fascism, can ever be the foundation of any lasting edifice. If ever two men have ridden recklessly and inevitably for an ultimate fall they are Hitler and Mussolini. I do not believe that any structure conceived in the minds of such men can be of enduring stuff. They are the scourge of our generation, not the architects of a new age.

. . . . . .

This high mood has, naturally, passed. No one could live, no nation could sustain itself for long at so great an altitude, such a white heat of endeavour. But, passing, it did its work. It welded the nation together. It made the struggle real, waged desperately by the people and not (as it had earlier seemed) cleverly by the Government departments. An enduring national spirit came into being in Britain in those great days of last summer.

Important—See under WANTED, page 68.

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A Cracking Victory

10th December, 1940

Tuesday. Yesterday morning our forces in Egypt took the offensive on the Egypt-Lybia border, making contact with the enemy on what the communiqué describes as a broad front. A surprise attack appears to have been engineered and according to Winston's statement in the House of Commons this afternoon progress is "satisfactory." The best part of his statement was his reference to "the British and Imperial Army of the Nile"—a characteristic flourish of Churchillian rhetoric. It is now known that over 4,000 prisoners have been taken. Our forces seem to have attacked the Italian right flank from inland, south of Sidi Barrani, cutting through to the coastal strip and the sea. The Navy and the R.A.F. co-operate.

Probably we are not committed to more than a biggish scale minor action, perhaps with the immediate object of pushing the Italians back from the area into which they advanced some months ago. But one suspects that there is also a testing of the Italian resistance and morale, with the readiness to follow up any conspicuous local success. The Italian aptitude for running away—at sea and in Albania—has been noticeable lately, and being, so to say, in the air, it may extend to Graziani's troops in Lybia. A relatively small push may start them on the run and once started they do not easily stop. But we ought not to expect too much; it seems unlikely that we should stage a major offensive of the "British and Imperial Army of the Nile" across this desert area, of whose difficulties so much has been heard.

The Italians certainly seem to be suffering the buffets of adversity. If one may judge the nation by their national policy over the past sixty years, they have asked for it. As for Mussolini he was the first man openly to rehabilitate war in its romantic glories after it had fallen into disrepute among the nations after 1918. For nearly twenty years he has indulged in fantastic adolescent imaginings of martial glory. He was the first to inculcate militarism into the minds of small children. He fed the Italian people on wordy fantasies of military glory—and even had to mutilate and murder thousands of defenceless Abyssinians to provide some appearance of the real thing. Now he and his unhappy Italians are getting the real thing in earnest—the realities of war, which are not glory and braggartry and the spoils of victory, as they appear in the inflamed imaginations of immature minds, but death, famine, toil, sweat and defeat.

11th December, 1940

The tale of prisoners in Egypt has grown to 6,000; otherwise, not much war news today. I am, I think, too tired to write this evening; too tired even to continue the agreeable game of lambasting the unhappy Musso and his unvictorious, non-conquering army.

12th December, 1940

Last night the capture of Sidi Barrani was announced. Today's communiqué shows we have won a cracking victory. At least 20,000 prisoners, and material so far uncounted. Our forces are still in contact with the Italians, who are in retreat along the coast road to Lybia. The R.A.F. seems to have established decisive air supremacy.

It will be interesting to see how a dictator State reacts to a defeat.

The death of Lord Lothian, Ambassador to U.S.A., was reported tonight. He was, I believe, one of the founders of *The Round Table* and a great exponent of progressive Commonwealth ideas.

15th December, 1940

Sunday. In North Africa, 26,000 prisoners so far officially reported, and we may guess that the final count from this operation—nipping off the Italian claw thrust into Egypt—will be round 30,000. A good haul.

Fighting is still going on about the border of Libya—which I have now learned to spell correctly. (One thinks wistfully of the days when spelling was a less rigid affair and the writer could in a measure exercise his own choice and taste, adding an additional touch of individuality to his work and having besides quite a lot of fun. Robert Bridges did something in this way in his *Testament of Beauty*, but spoiled it by working to a system. What

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we want is the flash of individual genius, like Blake's "Tyger, tyger," which transforms the common or jungle tiger into a beast of blazing imagination.)

The R.A.F.'s supremacy in the air must have played a great part in this victory. Events of the past few weeks are a triumph for Sir Arthur Longmore.

More and more strongly we come to feel that the spring must see decisive actions. Hitler is being driven into a position from which he must win a major triumph next summer, early rather than late. What triumph will avail except the subjugation of Britain?* A Britain, however, vastly stronger than in the late summer of this year and morally, so to say, at the top of her form. And it is most unlikely that this can be accomplished by the blockade within reasonable time, or in any effective way by air attack.

I have just read an article by Compton Mackenzie in one of the Sunday papers. He spells Lybia thus, in my earlier manner. Good. The B.B.C. was less sure of itself than usual with Argyrocastro. They started off confidently enough with something like "Argro-Kást-ra" ("as our Greek allies call it"). Then, abandoning our Greek allies, they proceeded to a mouthy jumble which sounded like "Angyr-Rók-astra." Meanwhile the Greeks captured the town.

One thing to be said for war, it does teach us geography. Angyrocastro, Koritza, Vallona, Sidi Barrani, Sollum—few of us had heard of them six months ago and less. Now they are familiar in our mouths as household words.

The other day I met a man who had actually been to Koritza. He conducted himself like one determined to be modest even though he had become a celebrity.

Another item of news today is that Laval has been dismissed by Petain. News reports add that he has been arrested. It is difficult to say anything good of Laval. He was not merely a defeatist; he burrowed like a mole to undermine the moral structure of France.

Today again—to revert to the familiar theme—it has been a lovely day without a cloud in the sky. At 2.15 this afternoon—1.15 by Greenwich—the sun's warmth on one's cheek was easily to be felt. In the high trees of our wood a colony of rooks were sitting, cawing raucously but not disagreeably as they probed and preened their breast feathers with their great pterodactyl beaks. Rooks are gaunt and, I sometimes think, primitive-looking creatures. Like the water-buffalo they seem to belong to an earlier epoch of life. Yet they are sociable if cunning birds. I like them best when I see them winging their homeward way just before dusk from the feeding grounds to their dormitory woods.

This evening the anti-aircraft guns are firing, some distance away towards London. Lately the enemy air raids have been less persistent and less heavy, except for occasional intensive attacks on selected targets. One comes to a stage at which bombing means little unless a bomb falls near enough to be physically disturbing.

17th December, 1940

The sinkings of merchant shipping announced on the 6 o'clock this evening were high; I did not catch the exact figure, but it was round 100,000 tons. That is too much. Here lies our principal danger. Increased long-distance air patrols are generally considered the essential counter-measure at the moment.

Meanwhile the North Africa assault goes on and today the capture of Sollum and Capuccio was announced.

To-morrow M. comes home from school; another term over.

22nd December, 1940

Sunday. There is suddenly much talk again of an impending invasion. The feeling of imminent conflict, which had relaxed a little while the air raids eased and we watched from afar the cheerful events round the Mediterranean, grows tense again. Our minds are moving back from Mussolini to the grimmer figure of Hitler.

How the tale of our island repeats itself. We are like our ancestors of 140 years ago who kept watch along the Channel coasts, straining their eyes out to sea when the army of Bonaparte waited invisible behind the Channel mists. And like our earlier fathers of Elizabeth's day who brought out their rusty pikes and polished them, assembling to meet the invasion of Philip's Spaniards.

If ever British soldiers have fought with fierce and stubborn courage—and our annals show that they have often fought thus, in distant countries and for a cause that must have been largely unintelligible to most of them—how they will fight if ever the Germans set foot on this island.

* *Note.*—In the event, as we now know, he chose Russia, and thereby sealed his fate.

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Ruminations on Christmases

29th December, 1940

Christmas has passed quietly, without bombing or any major development in Africa.

It was a lucky privilege at a time like this to be able to spend Christmas in my own home with my family. I think back to Christmas, 1918, which we spent somewhere south of Spurn Head having been blown off our homeward course for the Humber by persistent gales. We hove-to in the shelter of the land and I and my cabin companion cooked a plum pudding I had brought aboard, in a can on the top of our cabin stove. We had had a tough battering in the North Sea in our little 100-ton trawler, *King George*.

Christmas is the best of the festivals and the most noteworthy day in the year. A day on which it would seem incongruous and shameful to do a mean, harsh action has some potency and virtue in it.

I remember, as I suppose we all do, the Christmases of childhood. In particular, I remember the Christmas singers of the hushed village midnight. We lived then in the Vale of Belvoir, and it was the custom of both church and chapel to combine together to form a Christmas singing party—one of the few occasions when these sharply divided communities joined in a social activity, however intimate and friendly many of them might be as individuals. On Christmas Eve they went round the village late at night, having first visited the "lodges," as the outlying farms were called. Their arrival at our house was the beginning of Christmas, and I remember it with tingling vividness.

After going to bed I would lie awake in the darkness, at first too excited to sleep. Once or twice I even lay awake long enough to hear the distant voices of the singers at an outlying farm; but never until they actually came trooping with their lanterns up the lane and in at the gate.

Suddenly I would be wide awake again. A shuffling of feet was to be heard in the gravel drive where it curved into a crescent in front of the house. A flickering lantern-beam slipped through the window and danced across the ceiling; danced back again and rested for a moment, illuminating the lace curtains. Outside, more shuffling of feet and subdued whispers. Someone coughed. (Someone always coughed at this point.) The lantern beam darted back and forth crazily across the ceiling. A silence. Then the rich note of Dick Smith's cornet and in the still night air a burst of country voices:

> "*Christians, awake, salute this happy morn*
> *Whereon the Saviour of* (acute point for the trebles) *the world was born.*"

Someone always putting in a ponderous and growly bass.

I lay in bed entranced, enjoying the strange thrill and drama of the moment. It was Christmas Day; the day upon which all the winter verged and from which we should set off towards the still distant and invisible spring. Then my eyes perceived vague lovely lumpy shapes heaped on the bedside chair. I put out a groping hand, trying to guess by the shape what presents awaited me. A book, certainly. But what could this curious irregular package contain? Too dark yet to find out. The morning would reveal all.

The Christmas singers had completed their repertoire: "*Christians, Awake,*" "*While Shepherds Watched,*" "*Come, All Ye Faithful,*" and, perhaps, a specially learned carol less familiar than the well-known hymns we should later sing in church. The lantern flashed, its beams tracing their final flickering arabesque on the ceiling. The whispered conversation faded. A farewell cough and the shuffling feet shuffled slowly away. Silence once more and darkness.

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BEYOND THE DARKNESS

By Flight Lieutenant Arthur Hailey

[NOTE: *The author wishes to make clear that this is a story, and not a personal experience.*]

NOW that six years have passed, I think this story can be told.

It begins in 1941 when, with many other pilots, I was sent to Canada to train the aircrews which were needed so desperately at home. We were pretty comfortable out there, and I would have been quite happy had it not been for one thing. I couldn't for the life of me hit it off with the flight commander.

In self defence, perhaps I should say that no one else could either. Indeed, I think that Flight Lieutenant Factor was more thoroughly unpopular than anyone else I have ever known. It was his own fault—no doubt about that: at times he seemed to go out of his way to make others detest him. He was one of those people who seem to take pleasure in being surly and disagreeable, and his bad manners were notorious.

Sometimes, I think, he used to hope that one or other of the instructors would blow their top, but we managed more or less to contain ourselves. As a colleague, Flying Officer MacLeyland, put it: "There's nothing Factor would like better than to break one of us. But I've no intention of giving him the chance. The fellow's an out-and-out swine, and sooner or later he'll get what's coming to him. I'm content to leave it at that."

* * *

Among so much hostility, perhaps it may be wondered that Factor lasted at all. But he was a first-rate pilot and, technically, there was nothing wrong with the way he ran the flight.

The pupils he bullied shamefully, and when they landed after a flight commander's test, most of them were in a muck sweat. But Factor's attitude could be summed up in some words he once tossed out to the rest of us. "That's the way to get results; we've no time for psychological nonsense. If a man can fly, we'll pass him; if not, we'll fail him—there's plenty of raw material."

MacLeyland also had something to say about this incident. "Let him get on with it, Browny," he said. "With ninety-nine types those methods will get by. But sooner or later the hundredth man will turn up." Which, in view of all that happened afterwards, showed that Mac was not too bad a prophet.

It all began when a pupil named Barnaby was posted into the school. He was a great hulking chap, six feet high and broad as an ox. You could tell right away that he wasn't the brightest thing under the sun, and his record at elementary flying school wasn't too hot. But what had carried him through, I think, was his intense keenness.

Keen!—I've never seen anything like it. The only thing Barnaby lived for was to fly: that, and the knowledge that some day it would give him the chance to kill Germans. Yes, he made no bones about his intentions and, as a matter of fact, he had quite a case. I found out little by little—for I was his instructor—something of his family history. His father, it seemed, had been in the army and was killed at Dunkirk. His brother, an air observer, had bought it during the first R.A.F. raid on Sylt. Then his mother and two kid sisters were in the Bank tube station when it received a direct hit; none of them was alive when they were brought out. And he was a Jew.

* * *

Well, that was his story. Unfortunately though, Barnaby didn't really have the makings of a good pilot. On the controls he was as ham-fisted as they come. But, knowing how keen he was, I put everything I had into getting him through. Now, I don't want to shoot a line, but after a while he really began to show promise, until I was fairly certain he'd make the grade. The only thing that worried me was how he'd react to Factor's methods on the flight commander's test.

I had intended to have a quiet word with Barnaby before that took place but, as it happened, I didn't get the chance; while I was away one day, Factor whipped him into the air. That same evening we were due for night flying and, when I got to the instructors' crew room, I heard about it from Factor himself.

"You put Barnaby down for night flying tonight," he said.

"Yes," I answered.

"You're wasting your time," said Factor; "I washed him out this afternoon."

In our lingo his words meant that Barnaby was grounded. To say that I felt disappointed was putting it mildly. "Have you told him?" I asked.

Factor shook his head casually. "That's your business," he said and, turning away, went into his office.

* * *

I followed him. "Look," I said in as conciliatory voice as I could muster; "do you mind telling me what was wrong with him?"

Factor wheeled round at once. "What the

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devil!" he exclaimed. "Are you questioning my judgment, Brown?"

I kept my temper. "No," I replied, "but he's my pupil, and surely it's reasonable that I should know why you flunked him."

Factor answered grudgingly. "Borderline case. I've thought it over and decided he won't do."

"Don't you think a few more weeks' instruction might make all the difference?"

"Perhaps," said Factor in a voice that was ominously low.

"Then why not give it to him—put him back on the next course? It's been done before."

At this moment the mechanics began to start up some of the aircraft outside. But I scarcely noticed the noise. Instead I was watching the hate in Factor's eyes. "You impudent swine!" he roared. "Who the devil are you to tell me how to do my job. By God, I'll settle this once and for all!" He crossed to the door and called to MacLeyland who was in the crew room. "Get Barnaby in here." A moment later there was a tap on the door and the airman entered, saluting as he did. MacLeyland stood behind him.

* * *

"Barnaby," said Factor, "I sent for you to tell you that you're grounded."

There was anguish in the other's eyes. "You mean, sir . . ."

"I mean precisely what I say," said Factor; "that and no more. All right; you can go."

"But, sir," said Barnaby, "why?"

"Why? Dammit man! Because I say so. That's enough."

"But look here, sir," Barnaby began, "surely I can be told . . ."

"Get out of here," roared Factor; "I'll deal with you later."

For one moment I thought that Barnaby would burst, then, with all his weight behind the blow, he struck Factor full upon the jaw. The latter went down like a felled oak.

I have often wondered what thoughts were going through Barnaby's mind when Factor rose unsteadily to his feet. Perhaps, even then, he did not understand the enormity of what he had done. Or possibly, realizing that nothing could avail him now, he decided to have a last desperate fling. But, whatever the reason, Barnaby put his face close to Factor's. "You swine," he hissed. "You knew I wanted to fly, and I could have done it too—if it hadn't been for the pleasure that your warped little mind gets out of twisting people. Well, mark this, Factor—you've twisted me for the last time." And with that he flung out of the room.

* * *

I'll give Factor his due; the man remained calm. He pressed a bell push on his desk, and after a moment a sergeant entered. "There's an airman outside," said Factor, "named Barnaby. He's to be put under close arrest and taken to the guardroom." The sergeant went out without a word. I think he must have heard from outside what had been going on.

There was a silence which no one seemed anxious to break. Then—and I shall never forget this moment—the sergeant came running in. "He's gone!" he cried. "He's taken a machine!" For an instant we were all petrified. Even Factor paled. But we paused only a second, then rushed to the hangar door. "There he is," said the sergeant, pointing to where a red and a white light were moving away into the darkness.

I saw Factor race towards his car which was parked nearby. But before he could reach it the aircraft turned into wind and, both engines roaring, swept past the hangars. Half down the runway, the machine became airborne and began to climb; a moment later its lights were swallowed up in the darkness.

* * *

All night long we waited for news. None came and, at dawn, the search began. For five days it went on, but without success; nowhere was the aircraft or its wreckage to be found, and eventually we gave up.

There was an inquiry, of course, and a lot of things came out. But though Factor spent what I imagine was an uncomfortable hour with the station commander, nothing definite could be pinned on him; after all, Barnaby had struck the only blow.

And there it all seemed to end. Months went by, and the affair seemed more or less forgotten. Even I had ceased to think about it. Until one night—exactly a year later . . .

That night the weather was a bit sticky, and before allowing pupils to take off, Factor had decided to do a test flight himself. However, immediately after he'd gone, a message came through to say that fog was rolling in fast. This had happened before and I knew what to do; right away I gave orders for the recall signal—a white flare—to be fired.

Normally that would have brought Factor back at once. Therefore when ten minutes had passed with no sign of him, I began to get a little concerned. Going out in front of the hangars, I listened for the sound of Factor's aircraft. But I could hear nothing, nor were his navigation lights to be seen anywhere in the sky.

* * *

As I turned into the hangar again the sergeant fitter approached me. "Do you know who else is flying with Mr. Factor, sir?" he asked.

"There's no one with him," I answered.

"That's what I thought," said the sergeant.

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"But one of my men swears he saw someone else getting in."

Puzzled, I sent for the airman and questioned him. "Yes, sir," he said. "Just as the kite was taxying out, I saw somebody climb into the back. I couldn't make out who it was—it's pretty dark out there tonight—but it seemed like a big chap." He hesitated.

"Go on," I said.

"Well, sir, you'll think this a bit queer, but he seemed to come from nowhere. Matter of fact it gave me quite a turn."

I dismissed the airman and gave orders for a roll call; this showed that no one was missing. I shrugged my shoulders and tried to dismiss, as foolish, the thoughts which were taking shape in my mind.

I'll not bore you with details of all that happened that night. Enough to say that MacLeyland and I sat in Factor's office until, a little before dawn, a phone message caused us to set out across the prairies.

It was a Mountie who guided us; he'd seen flames and traced them to a gully. Well, an aircraft crash isn't a pretty thing and there wasn't much left of Factor, except bone and charred flesh. But Mac and I had seen stiffs before, and probably we wouldn't have been very shaken—if it hadn't been for two things. I'll tell you what they were and you can figure them out for yourself.

In the first place there was one body in the kite—*one only*. Second . . . well, haven't you guessed? Right alongside where Factor had crashed was the wreck of another aircraft. And from certain gruesome features we could tell it had been there quite a long time.

A year, to be precise.

Customs of the Services*

Recommended by the Air Ministry, this new edition of a deservedly popular little book for all officers in the Services, has come at an opportune time. First published in 1939 under the title of "The Customs of the Service," it ran into several reprints during the war. One day it may have to revert to its original title! Until that possibly far-off day, it will enjoy a long life in all three Services. Its popularity and usefulness will not flag in peacetime when it will be found an even greater necessity and expedient companion for all young officers aspiring to reach Air Rank!—C. G. B.

* By Group Captain A. H. Stradling, O.B.E., and published by Gale & Polden Ltd. (Price 5s.).

No Need for War BUT be Alert

General Smuts—that wisest of International Statesmen and World Counsellors—addressing the Congress of American Industry on 6th December, emphasized the difference between Western individualism and Russian Communism. He insisted that this need not involve war, but added:

"In such times as we are passing through we should keep our eyes open and be prepared at short notice to pass to a stage of 'alert,' as military parlance goes." Turning to Russia, General Smuts said:

The great Russian Communist experiment was the opposite of theirs of the West, and started at the opposite end.

"What is new and perhaps even more significant is the conscious, aggressive character of Russian Communism. Stalin's statement in the stress of war that Russian Communism is not an article of export does not correspond with the facts.

"On Guard for Peace

"I do not mean to imply that these fundamental differences of outlook and practice between East and West need mean anything like recourse to arms.

"In spite of widespread pessimism which I noticed both in Europe and in America about our present peace plans and policies, I see no real cause for alarm. Time and patience are good medicine for the maladies of the present.

"Meanwhile, let us face the facts with open eyes and due vigilance and take proper precautions. Whilst labouring for peace, let us also stand on guard for peace."

Referring to the British Commonwealth, he said: "Between the Communist East and your individualist West lies a bridge—another great group which forms a real link between them. From mutual exchanges and support between you two in all matters of human advance, both may hope to find light, courage and strength for the long road before you."

Arms Control Rules

Formulation of Agreed Draft Proposals on Disarmament

The establishment of plans for disarmament and control has been actively pursued during the past few weeks by the United Nations Assembly. At this juncture, we can do no more than record here the four important principles propounded by Sir Hartley Shawcross, the British delegate. These are:

1.—The atomic side of the resultation of disarmament must continue to be handled by the Atomic Energy Commission until the Commission has formulated its proposals. The General Assembly must not interfere with the work of that Commission.

2.—No partial system of disarmament should be adopted. We must not get into a position where, for instance, the manufacture of atomic bombs is pro-

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hibited, but the manufacture of other weapons of mass destruction—for instance, rockets—is not.

The Atomic Energy Commission should complete its present work and put forward a plan for the regulation of atomic energy. When that plan had been generally accepted, its actual coming into force must be contemporaneous with a similar plan in regard to other weapons of mass destruction.

"All we have to do with regard to the rocket is to abolish it. What we have to do in regard to atomic energy is to abolish its use for warlike purposes, but at the same time encourage the use of its vast potentialities for peace."

3.—Any system of disarmament must provide for an immediate and effective system of control and inspection. There must be full disclosure of information about armaments to be contemporaneous with the establishment of an organization for control and verification.

4.—The operation of a control and inspection agency and the extension of its work to newly-invented weapons must not be subject to any veto.

"There must be some international organization, not subject to veto, which can deal with newly-invented weapons. For when the atom bomb is abolished, scientists will, I dare say, devote themselves to the discovery of something even more terrible."

Australian Overseas Air Freight

Australian manufacturers are using Qantas Empire Airways air freight facilities more and more each month. Ready markets are available along the Australia-England route, particularly for less bulky commodities suitable for air travel.

Items sent regularly overseas by air to Malaya include flavouring essences, sweets, handbags, razors, enamel samples, underwear, perfume, cod liver oil, films, potatoes, powder, fountain pens, jewellery, freezing salts, ornaments, tooth brushes, letter clips, wheat meal, talc, soldering irons, motor parts, optical apparatus, lampholders, opals, dried fruits, pins, wines, electric cables, belts, pencils, sheep skins, food extracts, torches, orange juice, toothpaste, cigarette lighters, shoes, insecticide, radio valves and parts, electrical parts and pipes.

India receives regular consignments by air of hurricane lamps, bottles, concentrated food, toilet articles, sun glasses, cod liver oil, dental resin, carbon paper, dried milk, cosmetics, groceries, cement, torches, electric clocks, wax and insecticide.

Consignments to Britain include wool samples, condensers, syrup, metal brackets, rabbit skins, frocks, tomato juice, baby wear, veneer and radio valves and parts.

Other items are sent to Egypt and the Middle East.

Notice of Increases in Size, etc.

With this first number of a new Volume (XVIII) we have much pleasure in announcing a most welcome increase in the number of pages of text. This is the first increase since our supplies of paper were cut under the control regulations in 1941. We shall hope that this first modest increase will shortly be followed by other and more substantial increases, both in text and illustrations, until we are back at least to our pre-war numbers.

With this increase in the number of pages we are taking the long-deferred step of raising the price of the JOURNAL by the modest sum of four shillings a year, *i.e.*, one shilling per copy. In this connection it is only fair that we should point out that we refrained from taking the step earlier, which was fully justified by the greatly increased costs of production and raw materials, because we felt that war-time restrictions of secrecy and control did not allow us to give the value which our readers had become accustomed to expect.

We take this opportunity of assuring our readers that every effort will be made to maintain the high standard to which THE R.A.F. QUARTERLY has aspired during the seventeen years of its existence.

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Contributions are invited on the above. MSS. can be of any length. The main purpose of this appeal is to encourage everyone to record their personal experiences so that these may not be lost to history or the Service to benefit from in framing its future policy, organization, strategy, tactics, etc., etc. The main value of these contributions will rest ultimately on the deductions and recommendations they carry. Contributors are asked, therefore, to pay particular attention to these aspects. All contributions should be sent to:

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and the envelope marked "Lessons from the War." Prizes will be awarded for the best twenty contributions and all contributions published in THE R.A.F. QUARTERLY will be paid for additionally.

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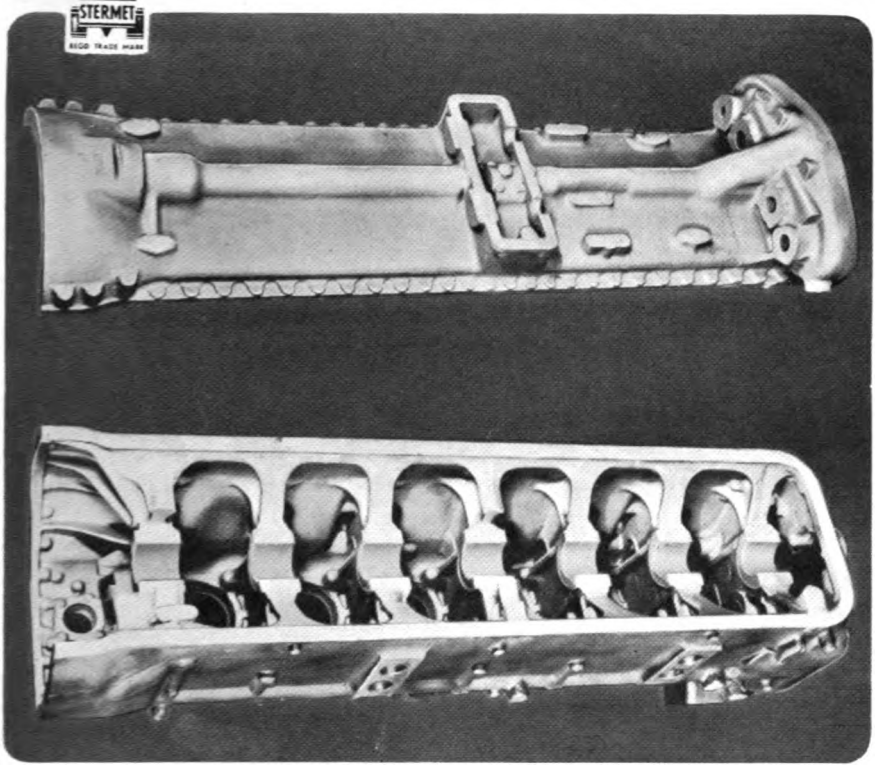

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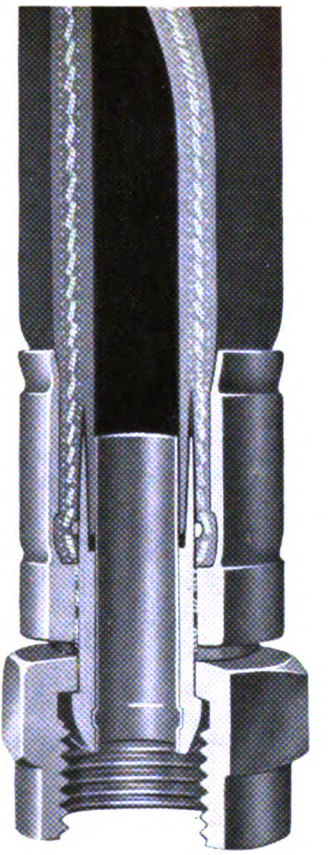

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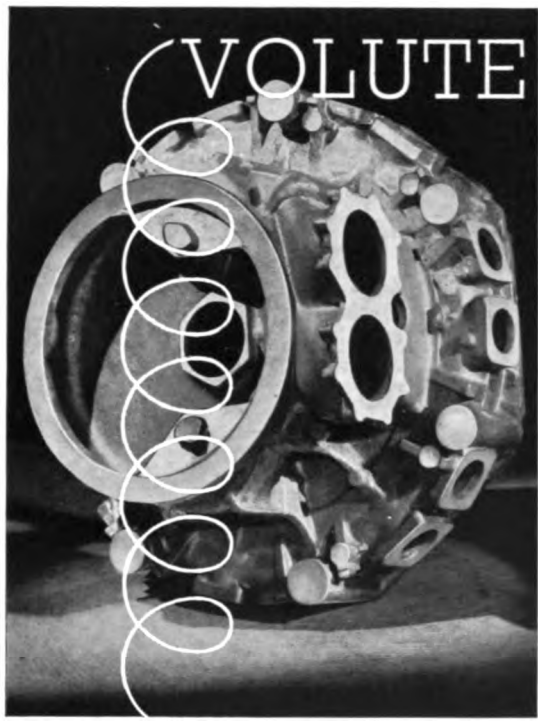

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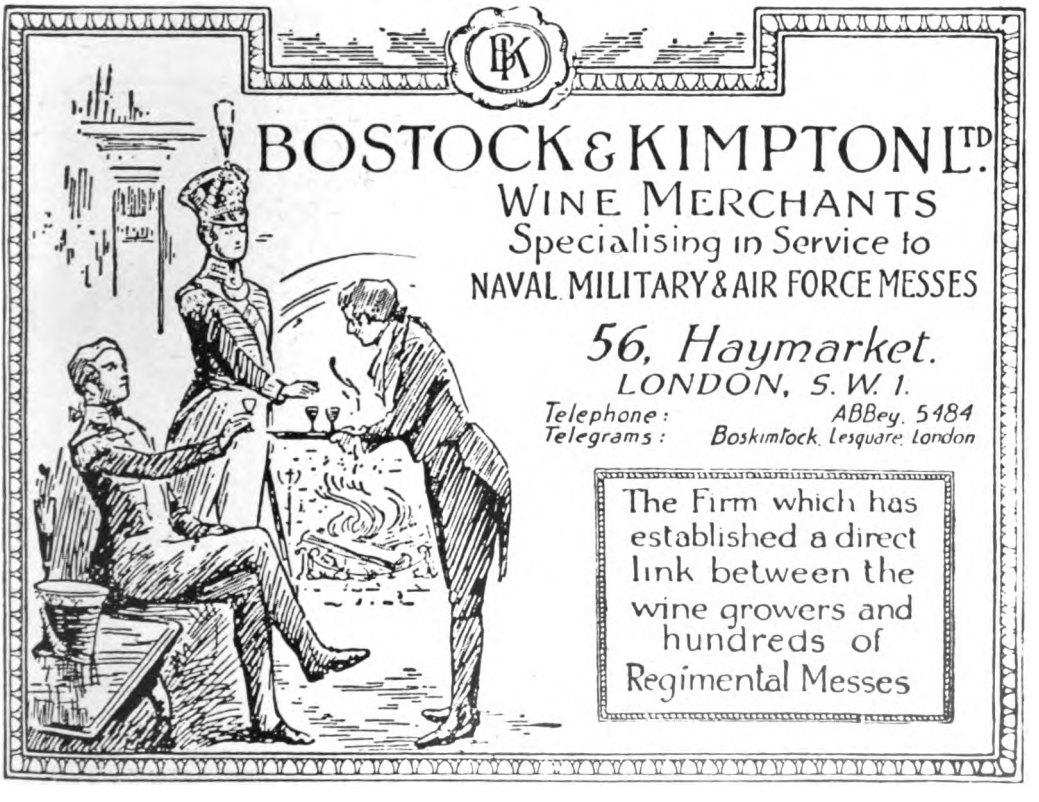
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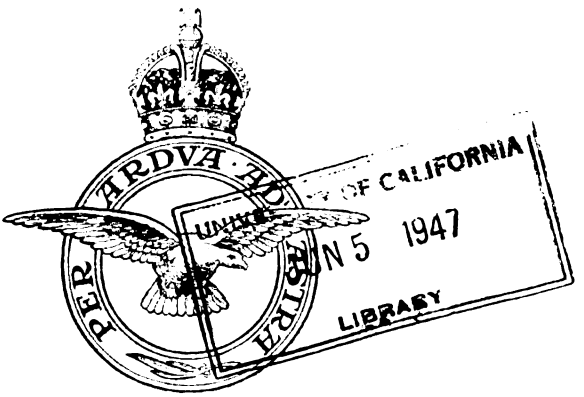

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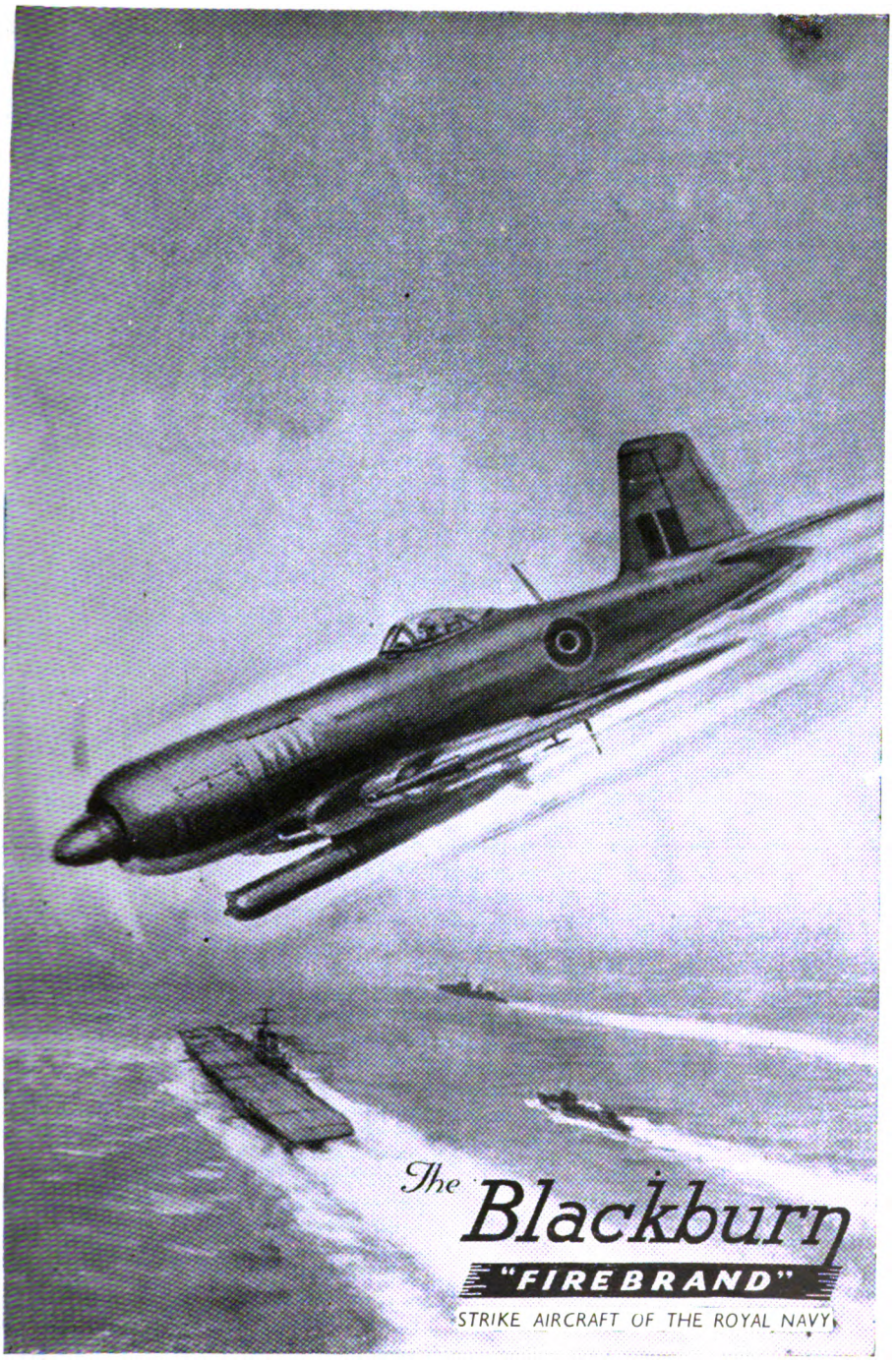

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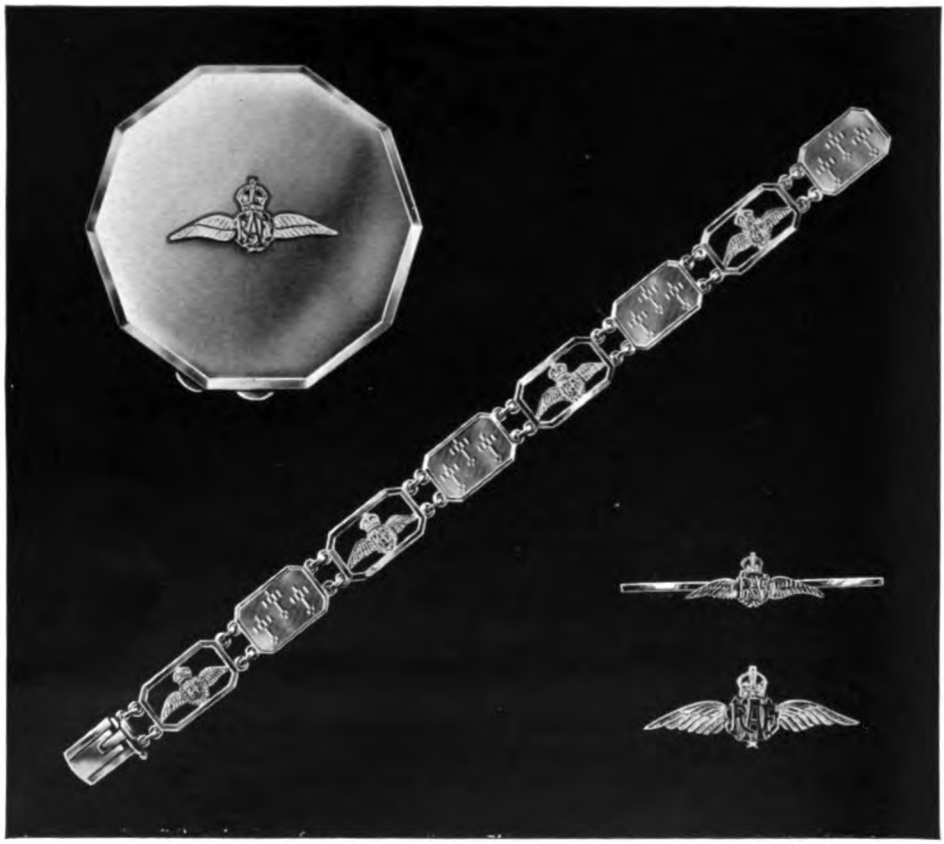

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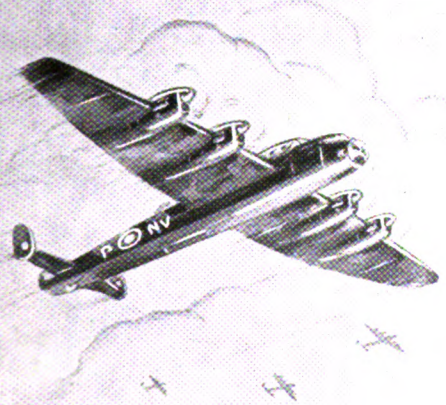

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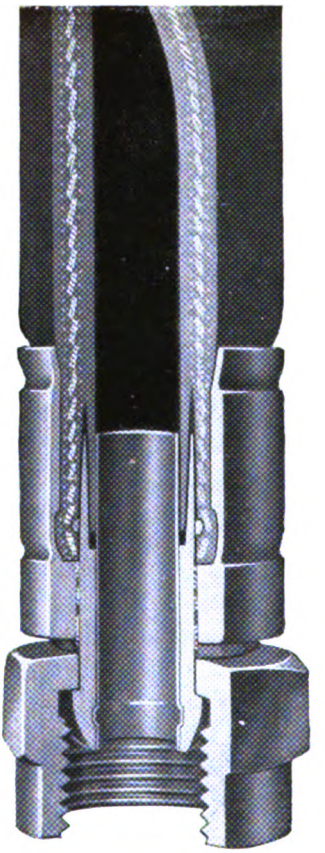

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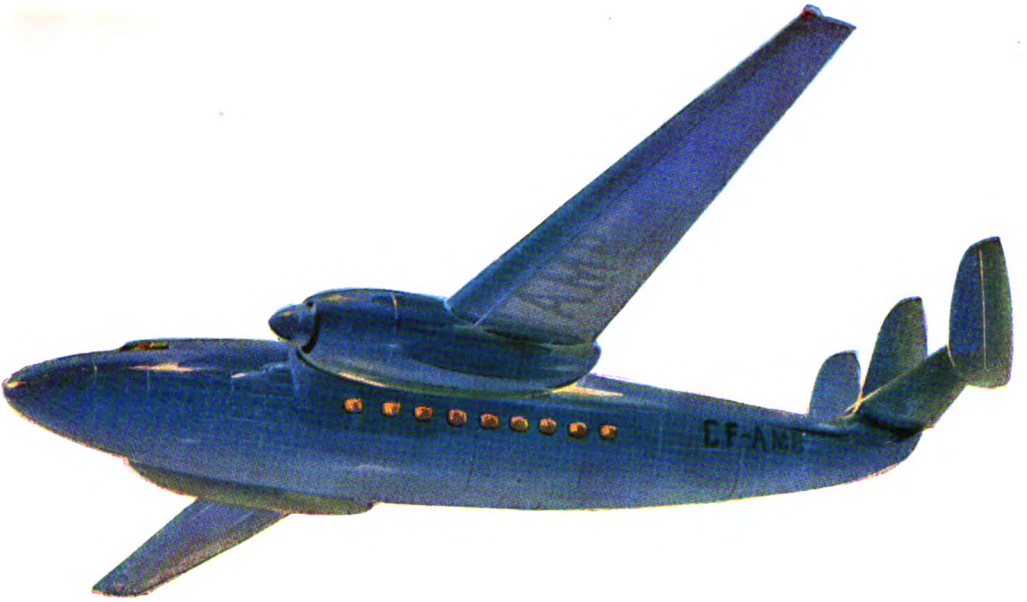

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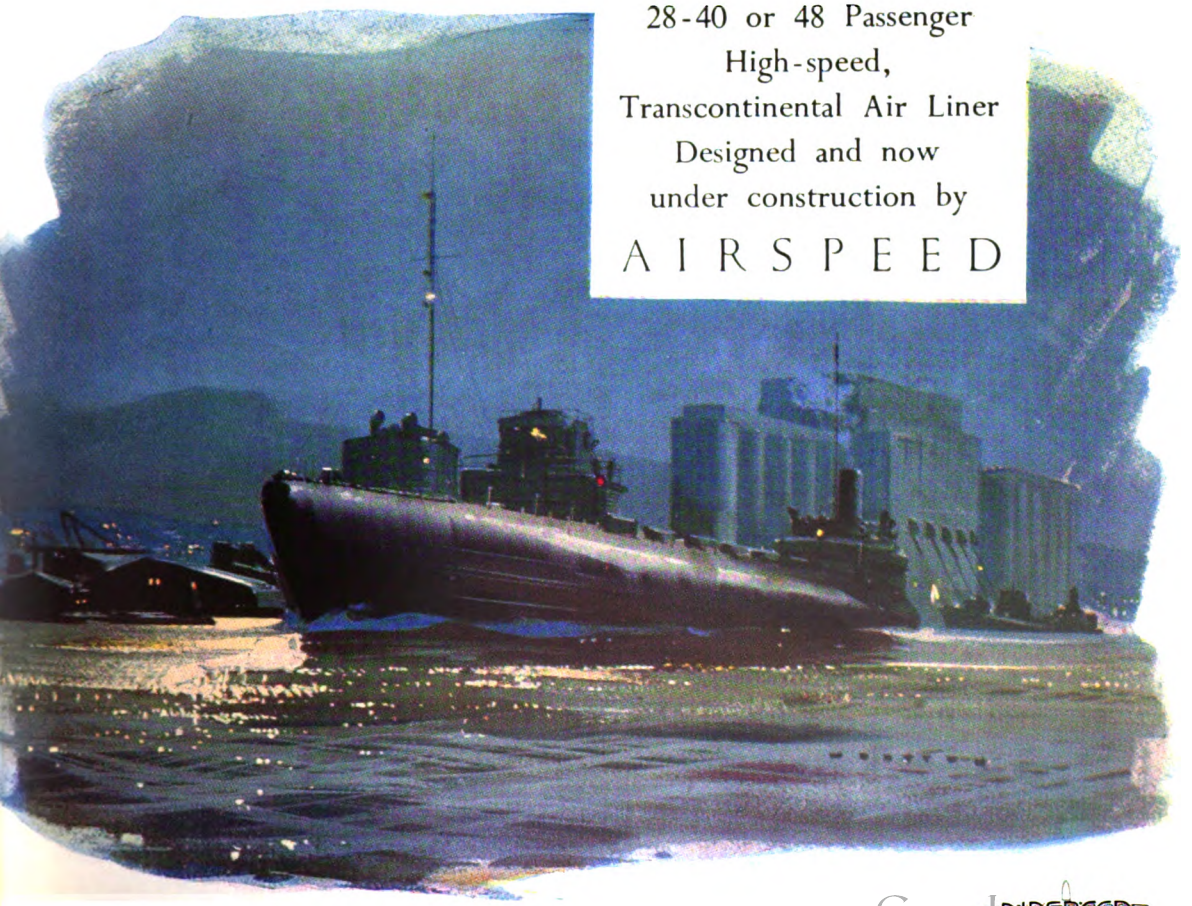

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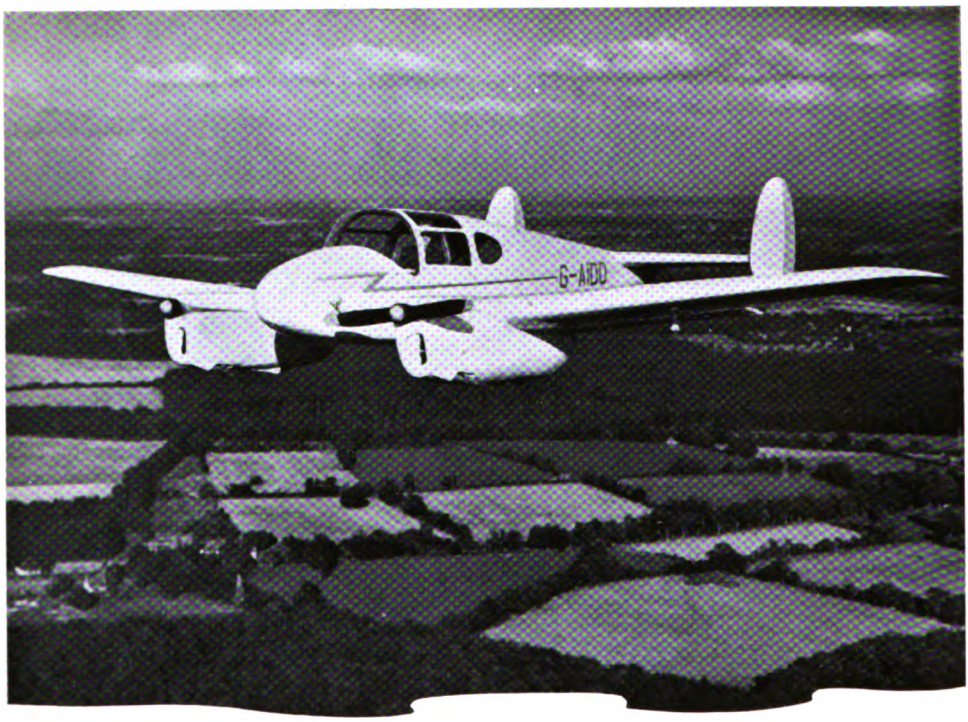

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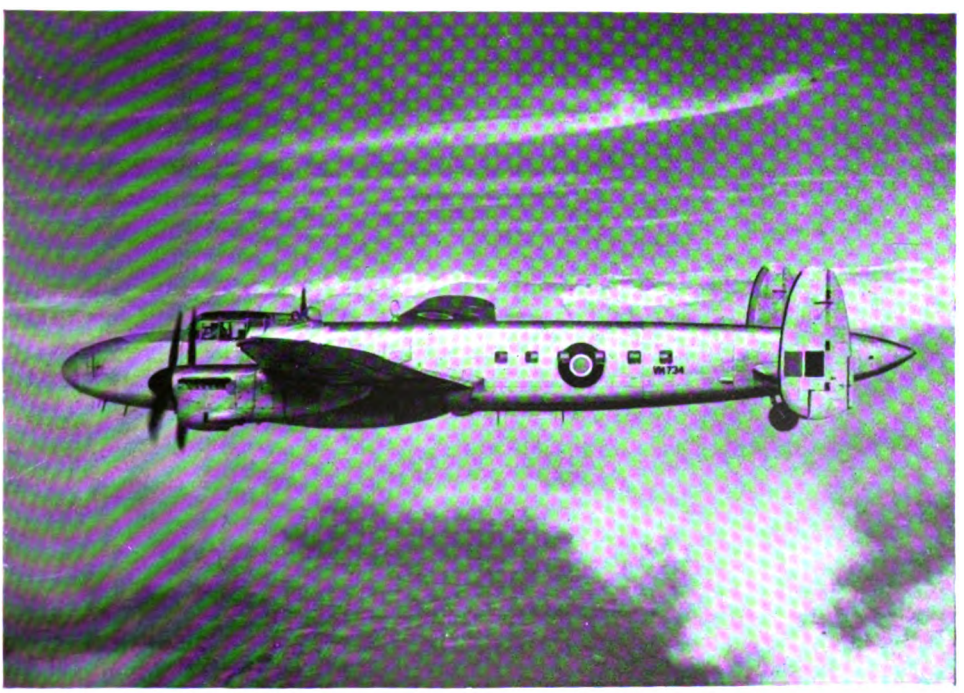

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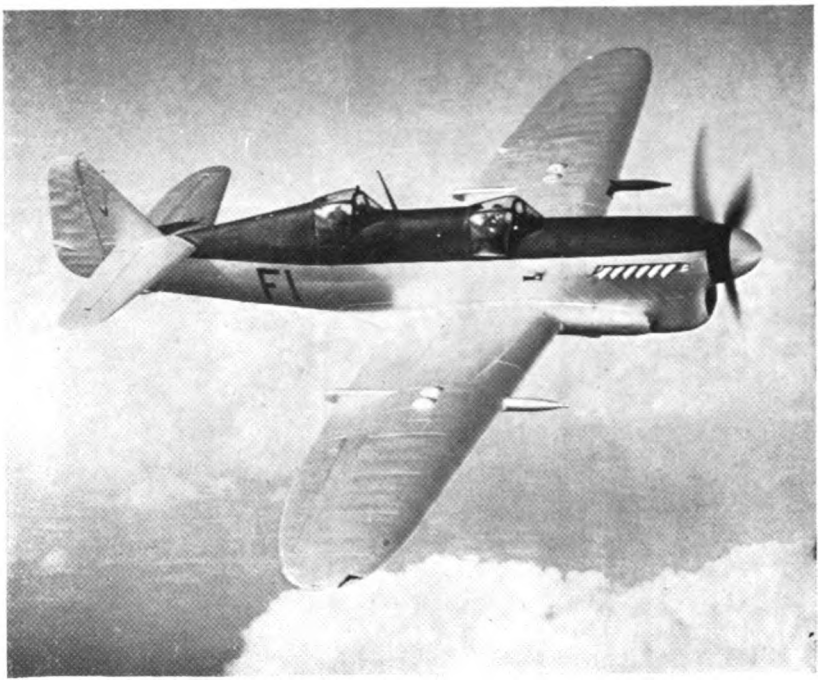

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MODERN WELDING TECHNIQUE

By C. W. BRETT, M.Inst.W.

OF what materials will aircraft of the future be made? Even glass has been tipped as a likely answer, but whatever the trend may be it seems certain that light metals will be indispensable whatever course future construction may follow.

Magnesium is the base of many of the most widely used alloys. During the years of war, production was stepped up to a remarkable extent. This served to reduce the cost of the raw material. The basic supply is inexhaustible for it can be extracted from sea-water in the proportion of about ¼ oz. for each gallon of water treated. The amount of magnesium used in several alloys is such that the finished product is actually inflammable in the form of small fragments or filings. Notwithstanding this characteristic welding can be safely undertaken so long as the proper technique is observed.

The foregoing indicates something of the striking progress made in procedure during recent years. The complete dependability of scientific welding that is well done has long been evident. Aspects that are not so widely appreciated are the large amount of experience required coupled with a high degree of practical skill on the part of the operator. These qualifications are essential to superlative work.

Undoubtedly the biggest task of all is in connection with general maintenance and repair. In this respect needs vary so much that seldom do two jobs require exactly the same treatment. All welding comprises a number of variable factors and it is intuitive judgment as to the proportion and balance of these variations which makes all the difference between first-class work and that which is, well, not quite so good. This is the reason why requirements of this kind are usually entrusted to specialists who are willing to guarantee every task undertaken on a money-back basis. Years ago this practice was instituted partly to inspire confidence, but nowadays failures do not occur. A potent reason for this reliability is not only the care taken in the actual work of welding but the strictness of the examination that is made at each stage of progress. This includes radiographical tests by which the weld is scanned in depth. No blemish, however small, can pass this probe without being laid bare.

Another line of progress, which may prove specially useful in aircraft construction, is the ability to weld together totally dissimilar metals. At one time this goal was thought to be impracticable on a commercial basis owing to the widely varying ratios of expansion and contraction between one material and another. The problems involved have been solved so completely, however, that, to quote an extreme case, aluminium can be welded to steel perfectly. When tests to destruction are made it is the weaker of the two parent metals which fails before the area of union. All manner of other combinations can be made, with the result that manufacturing methods are extended and, equally important, the field of repair has had its resources supplemented in a particularly useful manner.

Even engineers sometimes fail to appreciate that almost any degree of strength can be imparted when reconditioning a damaged part by means of scientific welding. The work is not confined to cracks and fractures but is equally effective in overcoming local wear and corrosion by building up the faulty areas with new material. Frequently it is feasible to use weld metal which improves the resistance to a repetition of further trouble. Thus it makes a component superior to a brand new replacement costing many times the price of guaranteed welding.

Equally important progress has been made in the handling of steel and other ferrous materials. Engine crankshafts that have been broken in two are reunited with complete assurance of success. In cases of this kind electrical welding is used. The method is to rejoin with multi-runs. The reason for this is because each successive layer of weld metal normalizes that which has preceded it. The last layer is "proud" and applied solely for normalizing purposes; finally it is machined away. Whilst there is little difficulty in restoring the original strength, accuracy of alignment is vital. The usual tolerance allowed is one one-thousandth part of an inch, but still finer limits are often specified and accepted.

Scientific welding offers opportunities to personnel that are most attractive. During the war there were insufficient operators in the forces. To ease this situation firms of specialists in this branch of engineering undertook to train members of the Services in the higher branches of welding technique, with results that subsequently proved invaluable.

As a means for maintenance, welding is in a class by itself. Unfortunately the benefits it offers are not appreciated to the extent that the results merit.

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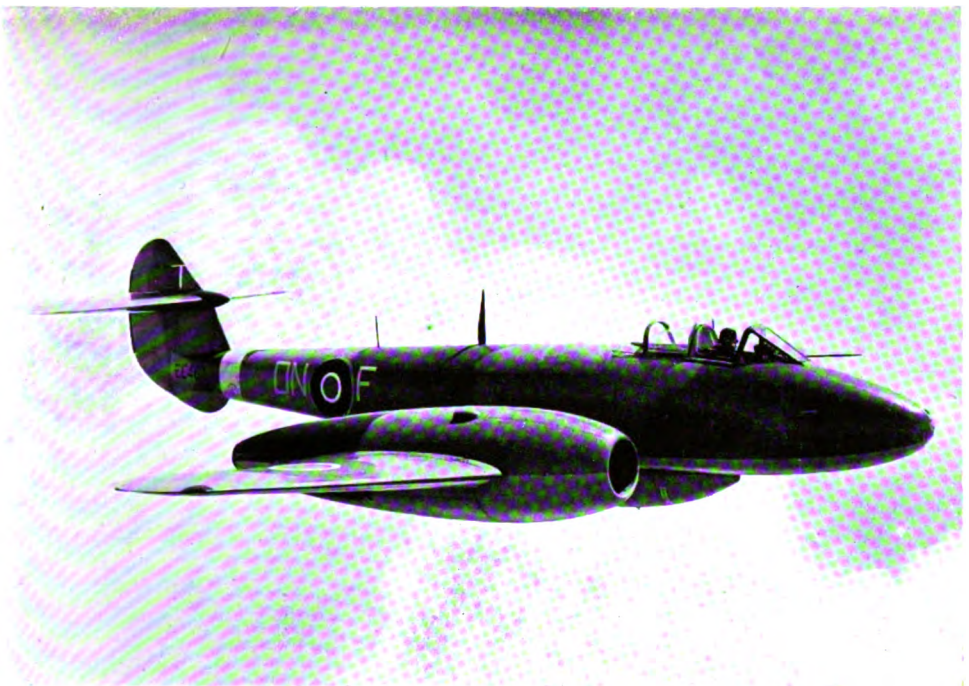

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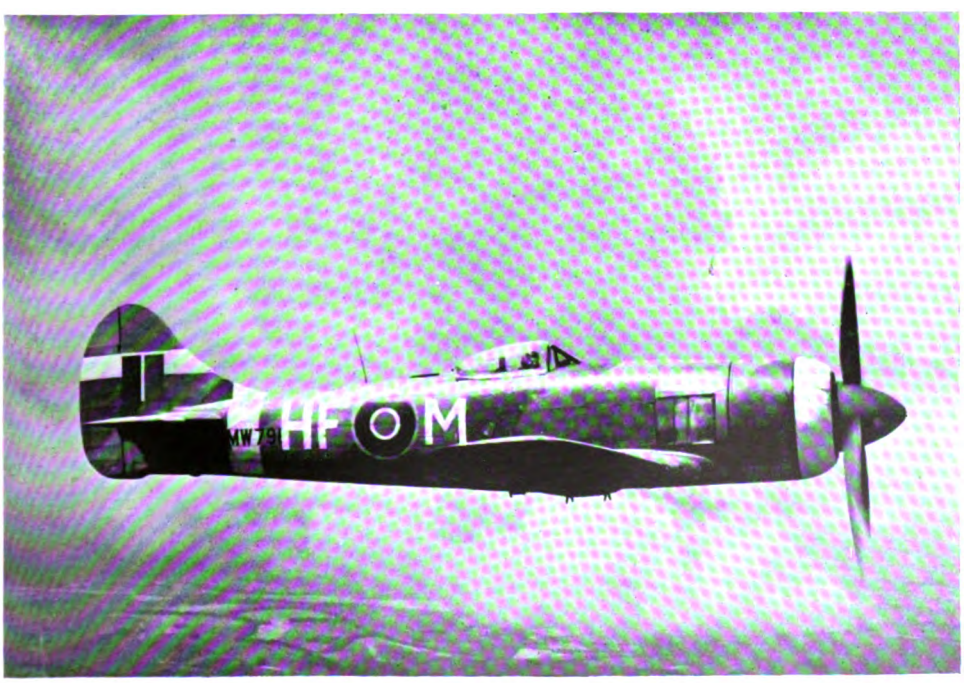

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SELECTING THE R.A.F. OFFICER

For some time a small enthusiastic band of men have been working on an R.A.F. problem which is fundamental to the Service, of immediate importance to every young man who aims at an R.A.F. Commission, and fascinating in itself! How to plan the selection of permanent officers on a sounder basis than before the war. The ideal system would be for the selectors to live with the candidates for months. This is impracticable, and a compromise has been evolved. It is not a final solution and much remains to be done, but it is a great improvement on the pre-war method of written examination-cum-interview.

Take the case of a candidate for a cadetship at the R.A.F. College, Cranwell. He hopes to become a General Duties Officer. The medical examination can settle whether or not he has the health to do the job. Science has made great strides in assessing his practical ability—his co-ordination of brain, hand and eye—and can give confident assessments through the "flying aptitude" tests. The written examination and his educational standard can help assess his intelligence and knowledge, but psychology has taught the vital difference between possessing intelligence and using it. On the character side, R.A.F. officers "know the sort of chap who fits into the life of the Service." And here are called in the psychologists and psychiatrists who can provide a scientific background and scientific methods to the intuitive judgments of the Service officers. Thus the "selection tests" our candidate undergoes in his quest of a cadetship.

The precise nature of the tests is not important; their purpose is to provide a setting in which to observe the behaviour of a group, and from that to judge the character of individuals. The tests, lasting about three days, take place indoors and outdoors in the country, with three groups of eight candidates passing through at a time. Candidates are anonymous, and distinguished from each other only by numbers. Their names are not known to the testing officers but only to the Commandant. This aims at eliminating any possibility of favouritism.

The members of each group are assessed from three different standpoints. There is a Wing Commander regarding them as a senior officer faced with potential junior officers; there is a Squadron Leader, closer to them in age and outlook, who looks at them as potential companions; and, thirdly, a psychiatrist who assesses them from his own specialist angle. The President of the Board has an overall view of the whole twenty-four and provides standardization. The problems set include both written tests and outdoor exercises. Some may be for solution by the group, some for solution by individuals. Some of the tests aim to assess natural intelligence, such as selecting the missing piece to complete a puzzle. A group, for example, might be asked to draw up a sports day programme for a village. No one is passed or failed on his ability to solve the problems or tests. In all the tests the officers are looking to see what qualities of character and ability are revealed.

The instructions given to each candidate include this passage: "The Selection Board wish to see you as your natural self and to find out your qualities and ideas. You will therefore assist the Selection Board most by being natural and excluding shyness or the adoption of artificial or superficial poses."

The final test used to be held at a lake. It may have been to transport a large drum and the team across the lake, with the aid of a rubber dinghy, thin poles, stouter planks, and some small drums. None of the team might wade across, and the large drum had to be kept dry. At each test each officer has jotted down concise observations, from which the final report is written. The final reports of the three different observers are co-ordinated by the President, and compared with his own impressions. The Board reach agreement on the first stage—assessing the candidate's ability, character and personality. Then begins the second stage, projecting the candidate forward and assessing his potential as an R.A.F. officer. When final agreement is reached, the overall assessment is forwarded to the Air Ministry.

An Appeal to All Ex-Service Men

The Air Ministry is appealing to all of you who served with or were attached to the R.A.F. during hostilities, to send to the Air Historical Branch, Air Ministry, Whitehall, details of any action or event personally experienced or witnessed which strongly impressed you as typical of the spirit of the Service, or the conditions and atmosphere in which operations were conducted. As it will be some years before the full official history of the war is published, the appeal is made to assist in the preparation of a preliminary history of the war in the air covering the 1939-45 period, which is to be written under the joint authorship of Denis Richards and Hilary St. George Saunders. The aim is to produce a work which will combine accuracy and impartiality with wide appeal.

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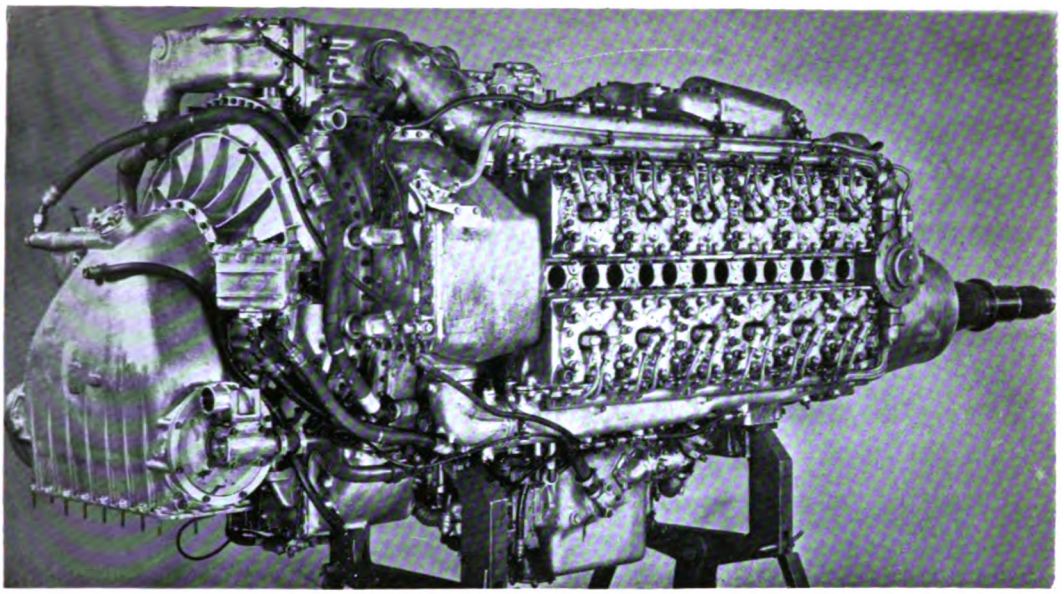

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Assisted by an Advisory Committee of Members of the R.A.F. and Air Forces of the Dominions

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EDITORIAL

World Affairs

I.—THE UNITED NATIONS

INTEREST in World Affairs is plainly concentrating on the prospects of world peace based on economic harmony and collective security, and in particular on the work of the United Nations to that end.

After an unsatisfactory beginning, the United Nations Organization has now settled down to constructive work. The turn of the year saw a marked improvement in the tone of its meetings and considerable, if unexpected, progress. When the Assembly concluded its first session in New York in December last, it had several important achievements to its credit. Drafts of the five peace treaties with the satellite powers had been agreed by the Foreign Secretaries' Meeting; the Atomic Energy Commission had completed an important stage in its work of bringing this mighty force under international control; the Assembly had passed a resolution which, it is hoped, may result in progressive disarmament; the Security Council had agreed to send an international investigating commission to the Balkans, that hot-bed of international friction. And, while it is true that the greatest task of the immediate future—the framing of the peace treaties with Germany and Austria—remains to be tackled, the considerable measure of agreement between the Great Powers that has been reached already is a good augury for the future.

If one fact, more significant than others, has emerged from the often-troubled waters of international diplomacy in 1946, it is this. International harmony, and therefore international peace, depends upon agreement between the Great Powers. The much discussed "veto" in the Security Council is an application of this principle, since it is, as *The Times* has pointed out, "a roundabout way of re-establishing the old and necessary unanimity rule." When the United Nations was formed, it was recognized not only that international peace depends upon the good will and harmony of the Great Powers but also that the responsibility for establishing and maintaining the peace of the world rests upon them, for they alone have the power to ensure it.

Britain as Mediator

In this Concert of Great Powers, the Soviet Union and the United States are undoubtedly the most powerful in material resources; and they stand, as it were, at opposite extremes of geographical situation and of political theory and practice. The United Kingdom is economically less powerful, and occupies a midway position both geographically and politically. Only with the support of the Dominions in the British Commonwealth of Nations is the third Great Power comparable with the other two in material resources.

But the geographical and political position of the United Kingdom, as the eldest member of the British Commonwealth, gives her an importance in world affairs which is no less than that of the Soviet Union and the United States. It is her role to keep the balance between these two —not the "balance of power" but a balance of economics and of political theory—and this she is peculiarly fitted to do. Being a part of Europe and having economic and political interests in many parts of the world, notably in the Near, Middle and Far East, where the Soviet Union also has considerable interests, she is bound to come to terms with this great European and Asiatic Power. And having bonds of blood and speech as well as economic ties with the United States, she is equally bound to harmonize her policies with the dominant Power of the Western Hemisphere. This difficult but honourable task is hers by force of circumstances. She has not sought it. But finding herself entrusted with this great responsibility, she will not shrink from it. Indeed, to renounce her high calling would be to relapse into a position of little power and influence in the world; and that a nation, which once led the world in economic progress and political freedom, should so evade her destiny is unthinkable.

In the present circumstances of austerity, of food and fuel shortages, of extended rationing, of high prices and high income tax, of strikes, of industry hampered by shortages of manpower, motive-power and raw materials, and of extensive military commitments in many parts of the world, it is well for the people to turn their thoughts, from time to time, to the fundamental questions that are the subjects of international conferences. By doing so, they will not only obtain relief from their more immediate worries but also gain some knowledge of the economic and political causes of their present distresses and of the goal to which their work and planning is hoped by stages to lead.

II.—WORLD FEDERATION

After every war the thoughts of war-weary peoples naturally and inevitably turn to world peace. How to secure this is a perennial problem, and much support is given to Tennyson's "Parliament of Man and Federation of the World." Mr.

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Winston Churchill referred to this solution of the problem in an article which he contributed to "Collier's Weekly" and which was reprinted in the *Daily Telegraph* of 30th and 31st December, 1946. Mr. Churchill's idealism is salutary and inspiring. As a prophet and former leader of the nation he is entitled to be heard, and his words are pregnant with hope and wisdom. He, more than most men, can see beyond the matters of the moment to that perhaps distant future when man will begin to fulfil his destiny and to recognize and understand the things that belong to his peace.

But there is a danger even in Mr. Churchill's optimism. It is the danger of raising high hopes prematurely. That a world federation will come cannot be doubted; but it is equally obvious that it will not come in our time, perhaps not even in the lifetime of our sons or grandsons. We have yet to establish a United Europe, which some consider must be a first step towards the wider federation. And to fix one's eyes upon the ultimate objective is to run the risk of neglecting the intermediate stages and so to make no progress towards the goal. Moreover, to raise hopes which cannot, in the nature of things, be fulfilled for at least several generations is to court disaster through hope deferred. It is better then, after this journey to the stars, to come down to earth and to consider the first stretch of the road which will, we hope, lead to world peace.

Economic Stability

If world federation is ever to become a reality it must be based upon economic stability. International trade must be so organized as to eliminate that degree of economic rivalry which renders some nations politically dependent and allows others, for political motives, to become economically dominant. It is a generally accepted principle of economic theory that a modern nation-state must maintain itself by producing partly for home consumption and partly for export, so that it can purchase from other nation-states those commodities which it cannot, or prefers not to, produce from its own resources. Only so can a standard of living be maintained in conformity with the development of modern ideas of what life should be. And as a further contribution to the economic efficiency and well-being of the world, it is necessary that, as far as possible, all nation-states shall produce for export those things which they are best fitted by their natural resources, man-power, abilities and knowledge to produce—be it agricultural produce, stock, minerals, manufactured goods of various kinds, scientific discoveries and their application, art, literature, alpine sports (which are one of Switzerland's invisible exports) or transport by land, sea and air. This last, it must again be pointed out, requires the freest intercourse of people and goods between all nations, with a minimum of passport restrictions and tariff barriers.

How far have we got towards the realization of these elementary ideals? Not far, it seems. But this very fact points to the first and immediate steps we must take in order to reach our ultimate objective. Upon these the statesmen of the world must concentrate, and are in fact concentrating. And this is, no doubt, the foundation principle upon which the Foreign Ministers' deputies are now (January) preparing the draft treaties with Germany and Austria, and upon which the Foreign Ministers themselves will work at Moscow in March.

III.—ALLIANCE WITH FRANCE

A new Anglo-French Treaty of Alliance was signed at Dunkirk by Mr. Bevin and M. Bidault, on 4th March, 1947. It will come into operation as soon as it has been ratified by the British and French Governments.

The main object of the treaty is clearly to consolidate and strengthen the defences against any possible German aggression in the future. It is equally clear that it is not intended in any way to be the foundation of a Western "bloc." On the contrary, it is so framed as to facilitate the making of a four-power agreement between the United Kingdom, the United States, the Soviet Union and France, which has already been proposed by Mr. Byrnes and is to be discussed at Moscow.

The following extracts from a report by the Paris Correspondent of *The Times*, dated 2nd March, indicate some of the treaty's outstanding features:

"According to French sources, the principal clauses of the treaty are four:

"(1) France and Great Britain undertake to decide in common the measures necessary if Germany were to adopt a policy of aggression or were to take any action that might threaten the security of either country.

"(2) If France or Britain were again involved in hostilities with Germany, the other party would at once lend all military assistance, whether the hostilities arose from armed aggression on the part of Germany, from action jointly decided on by the two countries, or from the application of measures prescribed by the Security Council.

"(3) France and Britain will consult with a view to taking all necessary measures in the

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event of Germany's failing to fulfil the obligations that have been or may be imposed on her.

"(4) France and Britain will consult on all economic questions that concern them.

"Further clauses provide that any action undertaken by France or Britain by virtue of the treaty shall be kept constantly in harmony with the obligations devolving from the United Nations Charter.

"A semi-official statement issued here specifies that the military clauses would come automatically into effect in the event of a conflict of one of the parties with Germany, whatever the origin. (It is, of course, assumed that aggression or unjustifiable provocation by France or Britain may be excluded.) Aggression by Germany might take the form either of an attempted invasion or of attacks against the occupation forces. Resistance to action decided on in common could mean opposition by force to the intervention by British or French troops seeking to thwart measures of rearmament or remilitarization; or if the intervention of either Power had been ordered by the Security Council. In all these possible cases the alliance would come into play."

The new treaty of alliance is one of the outcomes of the visit of M. Léon Blum to this country in January; but it had obviously been under consideration for some time before. M. Blum's visit "provided an opportunity for a joint examination of a number of problems of common interest to the Governments of the two countries and for a most useful exchange of views on a variety of questions." The alliance will form, when completed, the third side of the triangle whose other two sides are the existing Anglo-Soviet Treaty and the Franco-Soviet Treaty. And it will be purely defensive. In particular, it will be designed to protect the two signatory nations against any possible revival of the German menace which has twice, during the past quarter of a century, threatened to reduce them to impotence—and nearly succeeded. It is thus complementary to the other two treaties already mentioned, since they too have similar aims.

A Double Purpose

There is every reason to welcome such a treaty of alliance, and the news has been equally well received on both sides of the Channel. France and the United Kingdom have much in common. In finance and economics, in international affairs and defence, in politics and culture, their interests, though not identical, touch at a thousand points, and specific agreements on all matters upon which agreement is possible must and will be achieved.

The proposed treaty will serve a double purpose. It will go a long way to strengthen the foundations of peace in Europe in the immediate future, and it will be a stepping-stone to wider and stronger groupings of nations, whose best interests must always lie in the building and maintenance of a lasting peace, based on economic justice and on as great a degree of national and individual freedom as is compatible with the well-being of all.

The first and most pressing problems to be discussed will be France's need for coal and the future political organization of the Ruhr and Rhineland, though this latter will perhaps be more for the Council of Foreign Ministers to solve. There are also other questions of mutual interest such as the policies of the two countries in North and West Africa, in the Near and Far East, and in the Middle East, particularly towards the Arab League.

There is no doubt that the success of this, and of all future international treaties, will depend upon sound economic foundations. No lasting peace can be built on insecure or unjust economic conditions. The nations of the world are becoming increasingly interdependent, so that economic maladjustment in one part of the world almost instantly creates a reaction in other parts, and if not quickly rectified it is liable to result in war. For though the economic causes of war are by no means the only ones, they are among the more fruitful and the more difficult to remove.

Complementary Characteristics

Furthermore, this treaty will be welcomed by both peoples for reasons outside international politics and economics. It has been said—by whom we cannot recall—that French and British culture are dissimilar but complementary. Each nation has a vast literature of which it is justly proud, and scholars of both nations find as much pleasure and profit in reading that of the other as they do in their own. The histories of the two nations, which have sometimes been enemies and sometimes friends, offer striking contrasts. Latin influence is strong in Western Europe but less strong in the British Isles. France for a long time took the lead in European diplomacy and culture, while Great Britain led the way in industrial and commercial development. France has long favoured a centralized control of affairs both home and colonial; whereas decentralization has been the British way—at least until quite recently. With all these real differences, it may well be asked: What possible foundations can there be for an alliance?

The answer is to be found in the ideal marriage. The personalities of the two parties should not be identical, perhaps not even similar, but

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rather complementary, so that each may supply what the other lacks. Upon this, as one foundation, happiness can be built, but there is one other requisite—community of interests. The very differences between the French and the British cultures happen to be such that they can offset one another and may be the basis of a strong and profitable union; while the interests which the two nations have in common—love of peace, freedom for the individual, family life, scientific research, music and the other arts, industrial and commercial development and a reasonably high standard of living—all these render a firm alliance not only possible but particularly desirable.

IV.—TOWARDS A UNITED EUROPE

We are glad to note that a "provisional British Committee to further the cause of a United Europe" was formed in January with Mr. Churchill as chairman.

The proposal for a United Europe is no new proposal. It has been brought forward from time to time for nearly a century, and Mr. Churchill revived it again at Zurich in September, 1946. It cannot be said that it now has better chances of being realized. The difficulties are, if anything, greater. But it can be said that the need is more urgent now than it ever was. Europe is in a chaotic condition, and some form of unity is necessary if the nation-states which comprise it are to enjoy peace and prosperity.

The following quotations from the initial statement issued by the British Committee and published in *The Times* of 17th January, 1947, explain the situation and suggest a policy:

"The anarchy of Europe has already brought about two world wars in our time. If allowed to continue, it must surely lead to an even more terrible catastrophe. The final elimination of war can be assured only by the eventual creation of a system of world government. As a practical step towards this ultimate ideal, appropriate nations should be encouraged to group themselves together in larger units. Groups of various kinds already exist, such as the Pan-American Union, the British Commonwealth of Nations and the Union of Socialist Soviet Republics . . . The aim must be to unite all the peoples of Europe and give expression to their sense of being Europeans, *while preserving their own traditions and identity* (the italics are ours) . . . United Europe would have the status of a Regional Group under the Charter of the United Nations Organization and would naturally seek the close friendship and co-operation of the Soviet Union and the United States of America. . . . Since, for the moment, Governments find it difficult to take the initiative, the responsibility falls upon individual citizens."

A Cultural and Spiritual Conception

While most reasonable people will admit the gravity of the present situation and the desirability of some unifying action, no one can deny that the difficulties are enormous. In the first place, there is no comparable precedent. It is useless to point to existing federations such as those of Switzerland, the United States, Canada and Australia. All these were created out of separate entities that had much in common—far more than the nation-states of Europe have in common. The diversity of peoples in modern Europe is one of its most marked characteristics. It is a very rich mixture and no one would wish to reduce the richness by elimination. But this rich diversity of cultures makes the problem of unification more difficult than any problem of the sort that has ever been tackled.

For that reason, we welcome the announcement by the Provisional Committee that they "visualize a United Europe mainly as a cultural and spiritual conception," though how a union thus conceived can hope either to maintain peace within itself or to make its influence felt in other parts of the world is not very clear. Even during the Middle Ages, when Europe was practically synonymous with Christendom, the only real unity was a cultural and spiritual one; and that certainly did not prevent frequent wars nor did Europe as such exert much influence outside its own borders. It was not until after the so-called Reformation and the formation of rival nation-states that European culture and influence began to spread over the whole world; and that was the work of individual nations, generally in competition with one another, and not of a United Europe. This being so, we can but feel that, while a cultural and spiritual unity in Europe is very desirable, some more concrete integration will be necessary if internal peace and external influence are to be maintained.

Simultaneous Membership of Regional Groups

There are also various individual difficulties to be considered, the more obvious being the peculiar position and external connections of the United Kingdom and of the Soviet Union. "The standing condition of British foreign policy," says the leader writer of *The Times*, "is that the European and overseas interests of Great Britain must be continuously reconciled and kept in even balance." Great Britain's interests and obligations, as the senior partner in the British Commonwealth (*primus inter pares*) and as the controlling power in her Colonial Empire, would

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make it very difficult for her to assume a subordinate position as one of the United States of Europe, to which she undoubtedly belongs geographically. But we cannot agree with the writer just quoted when he says: "One of the troubles about any form of European union is that Great Britain can be neither excluded from it nor included in it" and "If these regional groups are to have any recognized substance, simultaneous membership of two of them would seem to any constitutional lawyer to present a curious anomaly."

The first quotation is surely a gross exaggeration of the difficulty. As for the second, we suggest that constitutional law bristles with curious anomalies, so one more or less would not make much difference; and that it is the duty of constitutional lawyers to reconcile such anomalies. Furthermore, simultaneous membership of two or more regional groups would surely enable a nation so connected to act as a tie binding those groups together and so facilitate progress towards a wider unity.

The position of the Soviet Union is similar. Russia is geographically a part of Europe, but the Soviet Union extends over a great part of Asia as well as Eastern Europe. Why should she, on this account, be excluded from the proposed European unity? Her interests and influence in Europe cannot be overlooked, while her extra-European interests and influence are no less considerable. She could, given encouragement and support, exert a powerful unifying influence between Europe and Asia, just as Great Britain even now exerts a powerful unifying influence between Europe and America.

The fact is that neither the United Kingdom nor the Soviet Union can be excluded, and if a United Europe is ever to be established it will be necessary to recognize this fact and to plan accordingly.

Tyranny or Democracy

It is natural for some and, we hope, pardonable, when experiencing the apparent uncertainties and compromises of a democratic government, the strikes and the peace-time shortages of necessaries, to think wistfully, though perhaps with an instinctive feeling of shame, of the simple and direct régime of Nazi Germany. Hitler, they think, even if they do not say it, knew how to organize and control his nation. Everything was cut and dried. The Government decided what was to be done and issued its orders. Civil administration, industry and commerce, the fighting forces, transport, religion, sport and entertainment—all were organized and controlled from the centre "for the benefit of the State."

It is an attractive picture and might be well worth studying and imitating—if it were true. But that is the snag. It was false. The Hitler régime was very plausible and, to all outward appearance, a workable solution of the problem of government. But like certain rosy apples that seem to be in perfect condition, it was rotten at the core. It was unsound from the start, though it took four years of peace and nearly six years of war to reveal its rottenness.

"Where Nazism Failed"

Sir David Maxwell Fyffe, British Chief Prosecutor at the Nuremberg Trials, pointed this out to members of the Royal Empire Society in January of this year in his lecture, "Where Nazism Failed." He referred to documents, produced at Nuremberg, which revealed the inherent weaknesses of the Nazi régime, weaknesses that are, it seems, inseparable from tyranny. Hitler was a typical tyrant, a super-man, whose dominating personality cowed all but the most powerful of his ministers and so-called "advisers." Few were to be found who dared give him honest advice; fewer still dared tell him the truth when the truth would be distasteful to him. And, such is the nature of tyrants, he would not listen either to sound advice or to factual truth.

Among the principal military causes which led to Germany's final defeat was her untimely attack on Russia in 1941. The Nuremberg documents show that this project was opposed by some of the highest officers of the German Army and Air Force. Raeder condemned it, and Keitel, Goering and Brauchitsch also advised against it. But Hitler would not listen to them. He preferred to take the advice of his "Yes men," Goebbels, Bormann and Himmler, who knew little about strategy and nothing of the difficulties of a campaign in Russia. And so the die was cast and there could be no going back.

The tragedy here, if such a sorry business can be dignified by the name of tragedy, is that Germany might very well have beaten the Western Allies in 1942 if she had not then been committed to a gigantic and costly war in the East, which the event proved to be foredoomed to failure. Raeder and Keitel knew this from the first, and so apparently did other leaders; but they could not prevent it. That is how tyranny works.

Impracticable Plans

Another weakness of the Nazi system was revealed in the White Paper on Defence, a study of which was made in the December number of this Journal. The plans of the German High Command were framed in great detail by officers who had neither the responsibility nor the knowledge for executing them; nor were those who

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would be called upon to carry them out always called into conference beforehand. As a result, many of the orders issued were found to be impracticable and the efficiency of the military machine suffered. By way of contrast, the operational plans of the Allies were framed in detail by those who would have to carry them out, and the result was success.

We do not suggest that a better system of planning might not have been adopted by Germany, even under the Nazi régime, but it is a fact that Nazi Germany did not adopt a better one. We do, however, suggest that such practices are characteristic of tyrannies, for a tyrant is, as we have seen, loath to hear expert advice lest it run counter to his wishes. He begins by trying to appear omniscient, and ends by thinking he is so.

Advantages of Democracy

"The march of tyranny," says Sir David Maxwell Fyffe, "may be direct but there is always a stiffness in its gait, even at its most formidable time. It slows up, and becomes bogged down by its own jack-boot."

We who have the privilege of living under a democracy are largely free from this disadvantage. Though the machinery of government may be slow and apparently cumbersome, though there is always an element of uncertainty in policy, and though some sections of the public can, with impunity, deny to the public as a whole certain necessary supplies and services from time to time, yet the freedom we enjoy as a democracy —free elections, an active parliamentary opposition, expert and informed criticism on all political, social and military projects—all these, though apparently slow in operation, do, we believe, enable us to prepare sound, workable plans—and to carry them out.

Combined Services Staff College

To meet the need for staff officers trained in the complicated and important duties of Joint Staffs, a new Staff College is being opened this year at Latimer House, near Chesham, in Buckinghamshire. It is to be called the "Joint Services Staff College."

Students will be drawn from the three fighting Services, the Home Civil Service, and also from the Dominions and India. They will normally have already passed through their own Staff Colleges before attending a course at Latimer House, and may be expected to go on to the Imperial Defence College some years afterwards.

Courses at the Joint Services Staff College are planned to last six months, and there will be accommodation for one hundred students. The syllabus will cover a wide field. It will include, among other subjects, the organization, functions, capabilities and limitations of the three fighting Services, problems peculiar to the planning and execution of inter-service and joint operations, imperial strategy and military geography, modern production methods and the organization of war production, Government direction in time of war, the central direction of war, etc., etc.

The Commandant of the Joint Services Staff College will be found by each of the three fighting Services in turn, and Rear-Admiral C. E. Douglas-Pennant, R.N., has already been appointed as the first to fill the post. The directing and instructional staff will also be drawn from the three fighting Services.

Staff Qualifications

Besides qualifying officers for service on Joint Staffs, attendance at a course at the Joint Services Staff College will also be a qualification for the higher staff appointments in the officer's own Service.

Immeasurable benefits must accrue, both to the three fighting Services and the Civil Service individually and to the armed forces as a whole, from this establishment for the study and application of the problems connected with combined and joint operations of which, as has already been pointed out in this Journal, modern warfare tends more and more to consist.

Thus officers of either Service may alternate between sea, regimental or squadron duties, attendances at the various staff colleges, and staff duties. But while it is impossible for every staff officer's career to conform to an ideal programme, it is clearly desirable that periods of staff duties should not be too long and should be separated by periods of sea, regimental or squadron duty or of naval, military or air command, so that the officers concerned may not lose touch with the conditions and circumstances in which the plans they make and the orders they issue as staff officers will have to be carried out. It is also desirable that officers of all three fighting Services, and particularly those who have to serve on Joint Staffs, should have some personal experience of the life and work of each of the other two fighting Services.

Problems of Imperial Defence

An interesting and fruitful debate on a motion submitted by Lord Strabolgi took place in the House of Lords on 29th January. In submitting the motion, Lord Strabolgi said that it was time there was a discussion on the long term policy of defence. In approaching this subject one was con-

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fronted, he said, at once by a number of imponderables. Amongst them:

1. How far were we going to succeed in making U.N.O. a reality?; and what was to be the nature, strength and composition of its international police force?

[The extent of this imponderable is well brought out by Sir Alexander Cadogan, British delegate to the Security Council, when speaking in New York recently on the problem of disarmament, referred to the "lamentably small progress" made by the military staff committee in organizing an international force for the U.N. In more than eleven months this committee, composed of officers of the five permanent members of the Security Council, had made almost no headway.]

2. To what extent can the new weapons, particularly the atomic bomb and the long-range rockets, be brought under *effective* international control?
3. Our peace-time military plans had been largely based for the last fifty years or more on the defence of India and the communications with India. What are to be the plans for their future defence?
4. Whether there was to be, by international agreement, an all-round multilateral reduction of armaments. This question was bound up with 2 above.
5. What was going to be our economic and financial recovery?

Despite these imponderables, he suggested that we could rely on certain fixed principles in dealing with the subject, and if these were recognized and understood the problems were simplified. The noble lord's main premise was that so long as we were dependent on overseas lines of communication we must be in a position to defend and control such lines of communication, otherwise we were naked and helpless. We were thus primarily dependent upon sea power and we could not without great strain maintain great land power *and* great sea power. "And it is a fallacy," said the noble lord, "to suppose that specialized military air strength will take the place of specialized naval air strength."

It would seem, he said, from the provision for an army of 1,100,000 men as well as a navy and an air force that we were pulling more than our weight on the land and less than our weight at sea.

To overcome the man-power problem, which had become and would continue for years to be our main concern, he suggested a much greater use should be made of the excellent material available within our colonies. He hoped that full use would be made of it in the future and that native troops would be taught to defend their own territories and their own interests. Only in this way could we reduce our own Army and release man power for service in industry and the Navy.

Viscount Swinton thought that no one would underrate the contribution of the Navy and the Merchant Navy in the recent war, but he thought that the ablest of naval strategists would themselves be the first to assert that these problems could not be looked upon as one-dimensional—a problem of one Service alone. In assessing the strategic and defence problem as a whole, and in assessing any individual or regional problem of defence, we needed the combined mind and the combined staff so animated. To-day we had the Ministry of Defence, the Combined Chiefs of Staff, Combined Planning, Combined Intelligence and Combined Operations—all these were accepted as axiomatic and fundamental in the functioning and planning of defence.

It was in that unity that strength, wisdom and economy lay. So, and only so, should we serve our own interests, the interests of the Commonwealth, and the interests of security in the United Nations.

Viscount Trenchard referred to three points arising from the terms of the Motion:

> "To draw attention to the contribution to be made by the United Kingdom and the Colonies to the solution of the problems of Imperial Defence."

First, how the invention of the atom bomb affected the weapons and methods of Imperial defence; second, the question: Is the proved power of air forces being taken sufficiently into account?; third, and most important, was the shortage of man power.

What the Chiefs of Staff and the Minister of Defence had to decide was what weapons and what tools the three Services should keep and maintain in peace for the next ten to twenty years; by which time "it may be that the Royal Air Force as we know it to-day will have to be drastically reconstructed because their aircraft and equipment will be as obsolete as battleships are to-day." Viscount Trenchard summed up by asking the Government whether the following principles were accepted as being correct:

First, that air superiority must be won before any type of warfare could be waged on any appreciable scale. "In fact, air power is the dominant factor in modern war."

Secondly, that at the present time sea power was still vital, but it could no longer be maintained by warships. At present it could only be maintained by air forces in co-operation with fast, small naval vessels, and it might be in years

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to come that it would only be maintained by air power or by some other means that would be developed.

Thirdly, that the Government must encourage by all means in their power the recruiting and training of a large number of men in the Colonies for the Services.

He concluded: "Our Services must work as one. That, I think, will be universally accepted. All operations depend at present on air predominance; and therefore on air strategy depends all strategy."

Canada and the United States Mutual Defence Agreement

On 12th February this year it was announced from Ottawa that Canada had come to an agreement with the United States to co-operate in planning and maintaining the defence of the North American continent. There is to be standardization of arms, equipment, training and organization. Each nation will retain control of activities in its own territory, but both agree to allow freedom of passage through and over their territories and territorial waters for the armed forces of either party, with all their vehicles, aircraft and ships.

This agreement is a development of the war-time co-operation between the two nations and ensures its continuance in peace. It is manifestly, and specifically declared to be, an agreement within the framework of the United Nations Charter. And it is equally certain that it will neither interfere with nor replace Canada's connections with the British Commonwealth. By securing the help of the U.S.A. for herself, Canada has secured it for the British Commonwealth, since the other nations of the Commonwealth could never remain aloof if one of its members were attacked.

Defence in Depth

In recent years, the strategic situation in North America has undergone considerable change, and it may be assumed that the U.S.A. stands to gain as much from this agreement as Canada. Whereas, in the past, the vulnerable frontiers of North America have been its eastern and western seaboards, the development of trans-polar flight has added a third vulnerable frontier—the northern. Any aerial attack on North America from Europe or Asia may well come across the north polar regions, and Canada's territory extends to the North Pole. An aerial invader, whose objective was the U.S.A., would certainly attempt to establish advanced bases on Canadian soil before deploying for the main attack.

The Economic Crisis and World Security

The Soviet Press and radio, in their non-stop attacks on Britain, have alleged that Britain's economic crisis was largely due to her foreign policy. They developed the familiar communist theme that Britain is maintaining "an enormous army entirely out of proportion to her population and normal requirements." Admittedly, Britain is at present over-committed economically and politically, in relation to her resources. The *need* to keep a million and a half men in the armed forces and in munitions puts a heavy mortgage on our man-power resources. We cannot shed any of our commitments in Germany, the Mediterranean, the Middle East, and South-East Asia suddenly *without immediate danger to world peace*. To quote Mr. Walter Lippman, and typical of recently expressed American opinion, we cannot withdraw our contribution to world security in a hastily or disorderly manner without unloosing an avalanche. Perhaps it is this avalanche that the Soviet Press and radio attacks are designed to bring about. Our readiness to co-operate and agree on a practical scheme of world disarmament has been made abundantly clear at the United Nations conferences. Disarmament must not be unilateral. The case was very forcibly put in the leading article of the Sunday *Observer* of 2nd March, which said that Britain is as right to play for high stakes in 1947 as she was in 1940 . . . "British armed power, in the present transitory and troubled state of the world, is an indispensable factor in the maintenance of peace. With the normal balance of power gone, and the effectiveness of the U.N. uncertain, world peace rests, precariously, on three balancing props: the power—at present *abnormally* over-extended—of the U.S.A., the U.S.S.R., and Great Britain. If one of these props were suddenly withdrawn, the underpinning of peace would give way, and peace itself might quickly collapse. Our withdrawal from Germany, the Mediterranean, or the Middle East would create vast power-vacua; and power politics, like nature, abhors a vacuum. Other powers would move in to fill the emptiness; and might easily clash.

"Of course we must work with all our strength towards a better, healthier and more durable basis of peace. But precisely in order to do that we must, for the time being, remain visibly powerful, even at the cost of postponed prosperity and increased economic risks."

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Defence Policy for 1947

A SUMMARY OF THE WHITE PAPER

THE "Statement Relating to Defence" (Cmd. 7042), which the Minister of Defence presented to Parliament in February, is one of the annual surveys of defence policy which it is now the custom of His Majesty's Government to publish before the estimates for the ensuing financial year are laid before Parliament. A special White Paper, "Central Organization for Defence" (Cmd. 6923), was presented to Parliament in October, 1946. It was mainly concerned with the plans for setting up a permanent Ministry of Defence, and was very fully dealt with in the December number of this Journal.

The White Paper now under consideration states that the year 1947 must be regarded as yet another transitional year, like 1946, and the defence problem still has the same two main aspects. These are: (i) the United Kingdom still has a number of major commitments overseas which require the presence of British Forces in various parts of the world; and (ii) the rapid release of personnel from the Forces makes it necessary to consider their future size and organization.

"Meanwhile," continues the Statement, developments in recent months have stressed the urgent need of restoring a balanced peace economy at the earliest moment, and by all practicable measures. Defence policy must be compatible with this national need not only because of the heavy demands made on national resources, both of manpower and material, by the Armed Forces, but also because a successful defence policy must find its roots in healthy social and economic conditions. It is both inevitable and right that the rehabilitation of the civil economy should increasingly absorb the country's efforts and resources, to the diminution of activities in the defence field. But it is essential that the fruits of seven years of intense war effort should not be thrown away by an ill-considered jettisoning of defence responsibilities, however admirable may be the aim of lightening the national burden. Two major wars in one generation have pointed the force of this conclusion, and His Majesty's Government are fully resolved to strike a considered balance between the needs of the defence of this country and the urgent requirements of the post-war national economy as a whole."

Current and Long-Term Commitments

Defence commitments in the coming year fall broadly under two heads: current commitments and long-term commitments. Current commitments, some of which are transitional, include the following: In Western Europe we must continue for some time to maintain forces in Germany for purposes of internal security and to support the Control Council in Berlin; and we must continue to retain forces in Austria until the Peace Treaty is signed. In the Middle East and Mediterranean, besides providing small garrisons for British Colonies, we shall require substantial forces of all three Services to safeguard our communications generally, to preserve law and order in Palestine and to control illegal immigration; British forces in Greece have been reduced and the remainder will, it is hoped, stay for a limited period only; and when the Italian Peace Treaty has been ratified it will be possible to withdraw our forces from Venezia Giulia, with the exception of a small contingent which will remain for a time in the Trieste Free Territory at the disposal of the Governor. In and around the Indian Ocean, some forces are being retained, for a time at least, in India and Burma, while in the Persian Gulf and Indian Ocean itself we have permanent responsibilities. In the Far East we must continue to provide garrisons for British territories, including Hong Kong and Malaya, and to assist in maintaining security; and we must continue to play our part in the occupation of Japan, with reduced forces; but all our forces have been withdrawn from the Netherlands East Indies. Elsewhere, small British forces will be required to provide support for local forces in Africa and in the West Indies.

Long-term commitments will be dependent, to some extent, upon the policy and influence of the United Nations and upon the progress of general disarmament by consent, but they will always be considerable. These include the following: the security of the United Kingdom (which is not only our homeland but also the main base for specialized training and administration of all our forces, including those overseas) is, of course, of paramount importance; the safeguarding of communications is vital to the defence of the United Kingdom and to the preservation of the links with the other parts of the Commonwealth and Empire, and it requires the maintenance of considerable forces in various parts of the world; and last, but not least, our contribution to the forces of the United Nations, under Article 43 of the Charter, will have to be provided, when called for, and placed at the disposal of the Security Council.

In fulfilling these commitments, the main burden falls upon the Army, while the Royal Navy and the Royal Air Force, though extensively involved also, enjoy a comparatively greater opportunity for preparing and organizing themselves for their post-war duties and respon-

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sibilities. "Despite the demands made by current defence commitments all over the world, however, it may be anticipated that, in the absence of any unlooked-for worsening of the international position, each of the three Services will be increasingly concerned with planning the permanent post-war organization, distribution and composition of its own forces."

Manpower

"To maintain the Armed Forces at the minimum numbers necessary to enable them to fulfil the role and carry out the commitments described above, a major demand must continue to be made on the manpower of the United Kingdom, both for their uniformed personnel and also for those engaged on the production of Service arms and equipment." It is estimated that the numbers of men and women who will be serving in the Forces on 31st March, 1948, will be 1,087,000, and that, during the financial year 1947-48, a labour force of approximately 450,000 will be required to meet the production and related requirements of the Services.

"This demand on the manpower resources of the country, which is admittedly heavy, must be considered against the background of the world-wide commitments noted above. Improvements in the international situation may permit of reductions in these commitments, and in the resulting manpower demands of the Services; but, on present information, His Majesty's Government are satisfied that the numbers quoted above for the Armed Forces and their supply are the minimum required during the coming year for the fulfilment of commitments, for the training of the Forces in view of the rapid run down of trained personnel, and for the arms and equipment without which they cannot be effective."

The great majority of men and women who were drafted into the Forces during the war have now been returned to civil life and to industry, which certainly needs them. But industry's gain is a serious loss to the Services. It has entailed extensive reorganization, and that, in turn, involves the inevitable, though temporary, reduction of operational efficiency, which must remain until the new intakes are trained. A certain risk has been taken in allowing releases at the rates which have been adopted, and the Government declares that there is a limit to the risk it is prepared to accept.

Reference is here made to the decision of His Majesty's Government to introduce a Bill for continuing the system of national service in the Armed Forces. This decision was made because it appeared likely that "the rapid developments in modern warfare would rob this country of the breathing space—measured in years rather than months—by virtue of which alone in the past two great wars it has been enabled to build up its warlike strength and thus overcome its enemies." At the outbreak of any future war, there will be an immediate need for large numbers of reserves, available at short notice, for the immediate task of defence. The large numbers required can only be provided by a system of national service, consisting of a short period of regular service and several years of reserve service. It should also be borne in mind that a peace-time system of national service will make large demands upon the Regular Forces for personnel to train and administer the new intakes.

Production, Research and Development

Four principles will guide His Majesty's Government in the coming year in arranging for the supply of equipment for the Forces. They are:

(*a*) Concentration on research;
(*b*) The limited introduction of equipment of the most modern kind;
(*c*) The maximum use of accumulated stocks; and
(*d*) The maintenance of a reasonable war potential.

The Joint War Production Staff and the Ministerial Production Committee, working under the direction of the Ministry of Defence, will ensure: (i) a properly balanced allocation of production resources among the three Services, and (ii) in the interest of the country's already strained economy, the limitation of the production of war material to the minimum needed for current maintenance, for a nucleus war potential and for the introduction, on a modest scale, of the latest types of equipment.

The 1947 production programme of the Royal Navy amounts to little more than the maintenance of the existing Fleet and the continued construction of ships already begun. The re-equipment of the Naval Air Arm will be continued, as also will be the refit and repair of ships in full commission, and of many of those now in reserve. The Army's programme also consists mainly of essential maintenance, but obsolescent armoured fighting vehicles will be replaced by those of the most up-to-date types, and Anti-Aircraft Command will be re-equipped with the latest type of equipment. The Air Ministry's programme provides for the continued progressive rearmament of the Royal Air Force with the most modern types of jet-propelled fighter

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aircraft, the replacement of American transport aircraft, and the introduction of a modern type of aircraft for the carriage of Airborne Forces; while obsolete training aircraft will gradually be replaced by those of modern type.

"His Majesty's Government attach the highest importance to the encouragement of scientific research and development, which is of particular relevance at a time when economic considerations must limit expenditure on new equipment so severely, and so make it more than ever essential that maximum value for money is obtained. With the constitution of the Defence Research Policy Committee, a start has been made on the consideration of longer-range planning for defence research and development. Through its close link with the Chiefs of Staff, the Committee will be continuously aware of the latest concepts of strategic and operational thought, and will itself be able to influence those concepts by reason of its knowledge of future trends in the field of defence science. From this collaboration will emerge a unified and comprehensive view of the probable nature and methods of future warfare, on which His Majesty's Government's defence policy can be firmly grounded."

Finance

The defence estimates for the financial year 1947-48 are as follows:

	£
Navy	196,700,000
Army	388,000,000
Air Force	214,000,000
Supply	100,300,000
Total	£899,000,000

Each of the Service estimates includes its own share of the cost of production, and the Supply estimate is mainly for research, development, related works services and certain inspection services. £118,500,000 of the above total represents terminal charges of various kinds, *e.g.*, release leave, clothing issued on release, compensation for contracts terminated and for land requisition, etc. This sum may therefore be deducted from the total, leaving a net current expenditure of £780,500,000.

If any comparison is made between these figures and the corresponding figures of pre-war estimates, it should be borne in mind that the war has left us with abnormal and expensive commitments overseas and an immense programme of training and regrouping. Since 1939, too, the pay and allowances of the Armed Forces have been considerably increased.

Conditions of Service

Improvement in conditions of life in the Armed Forces, begun before the war, was necessarily interrupted during the war, but even so, much was done to ensure the comfort and welfare of all ranks and ratings and to cater for their educational needs and restricted leisure. A prominent feature of education in the Services was and is "Citizenship." Projected improvements in accommodation are held up by very considerable arrears of maintenance work on barracks and married quarters, and by shortages of labour and materials, but His Majesty's Government are fully determined to raise the living conditions of men (and women) in the Armed Forces to a standard much higher than that of pre-war years.

Meanwhile, the "humanization" of Service life proceeds. All unnecessary restrictions on freedom off duty have been or will be removed. This policy, it is firmly believed, is "not only reconcilable with the maintenance of a high state of discipline, but will in fact help to achieve it."

"It has also been the concern of His Majesty's Government to ensure that the Fighting Services are casting their net as widely as possible to attract to a professional career in the Navy, Army and Air Force a due proportion of the best of the country's youth. No candidate should be prevented by lack of means from obtaining a regular commission in the Armed Forces. The standard required of candidates is rightly high, both in education and in character and leadership, but the Government are confident that the right type of young man can be attracted to the Forces, and there given a full and varied life in which conditions, prospects and rewards do not compare unfavourably with those of civilian life, and opportunities for education and development of personality are not less than in the world outside."

Conclusion

The year 1947 must be regarded "as a stage, and perhaps not the final stage, in the transition from war to peace," during which post-war resettlement and the revival of the national economy must necessarily take first place in the thoughts of the people and in the deliberations of His Majesty's Government; but as the foregoing shows, the need to plan our post-war defence policy and to avail ourselves of the latest scientific developments is not being overlooked.

"The supreme object of British policy," concludes the White Paper, "must be to prevent war. The role of our Forces must therefore be to deter aggression while at the same time safe-

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guarding British interests against attack. It is against that fundamental background that the place of defence in the general structure of national policy must be determined."

Comments on the White Paper

Consideration of the White Paper in the light of the present political situation abroad and the economic situation at home suggests the following thoughts:

1. The world is in a very uncertain state, and until we can rely upon the collective security of the United Nations (to which, of course, we shall contribute) it will be necessary for us to rely upon our own strength, supplemented by appropriate defensive alliances (which can be secured only if we are strong), to ensure our continued existence and to maintain our legitimate place in the world.

2. On the other hand, the state of our finances, and industry's vital need for manpower, make the drastic reduction of our Armed Forces seem essential. It is argued that we should not attempt to maintain armed forces greater than we can afford, and that men and women would be more profitably employed, from the national point of view, in factories than in the Forces.

3. We are, it appears, on the horns of a dilemma. If we do not considerably reduce our Armed Forces, industry will starve and be unable to support them; and if we reduce our Armed Forces, we run the risk of losing not only our influence abroad but also our very existence as a nation.

4. The facts are that industry and our national life depend upon our Armed Forces, and our Armed Forces depend upon industry and the manpower of the nation. So a balance must be struck, and the only debatable question is what proportion of manpower and money should be allotted to industry and what to the Armed Forces? That question His Majesty's Government alone can decide.

Finally, we reprint a pregnant paragraph from a leading article in *The Times* of 15th February, which puts the whole thing in a nutshell:

"The statement . . . comprises in the briefest possible form a ready guide to the broad principles upon which the Government are founding their defence policy. It is clear and, within its scope, comprehensive. Perhaps naturally it does not extend far into the realm of strategy. On the other hand, the strength and equipment of the Armed Forces are mainly governed by the tasks which they have to perform at the moment and the preparations which they have to make for emergencies. It has been too readily assumed in some quarters that a grading-down of military responsibilities is a feasible remedy for the manpower shortage. An attempt to stimulate the foreign trade upon which the prosperity of the country depends by denuding the trade routes of protection might indeed be robbing Peter to pay Paul. A nation which lives by oversea trade and which, however grievous its present distress, yet possesses and controls much that is enviable cannot afford remedies of this kind. Moreover, the strength of the United Kingdom and its capacity for survival depend in large measure on the strength of its links with the Commonwealth and Empire. By relaxing them it would in the first instance enfeeble the other countries of the Commonwealth, but in the long run it would no less surely enfeeble the whole structure, and therefore enfeeble itself. It is dangerous to talk of 'shedding commitments,' as though the defence of Empire communications and the defence of the Middle East were burdens pure and simple, the removal of which would lighten the ship of state. So would a battleship be lightened by the shedding of its armour. The present strategic framework has been based upon necessities. It does not appear to represent over-insurance, and the cutting away of any considerable section of the structure would tend to make the whole of it meaningless."

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The Evolution of Military Preventive Medicine

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This article was presented as a thesis at the R.A.F. Staff College, and the author deals with the subject with special reference to the R.A.F.—Ed.

"...we may find that disease is a more dangerous factor than enemy resistance. We must be as practised in the use of our weapons against it as against the tactics of the enemy."

—FIELD MARSHAL LORD WAVELL.

INTRODUCTION

Definition and Aim

Military preventive medicine consists broadly of the application of the principles of hygiene and sanitation to a military force. Its aim is to maintain the highest possible standard of health in the force and to ensure its physical and mental fitness for its task. The aim must always be contributory to the higher aim of the commander of the force.

Essential Characteristics

In the practice of medicine as generally understood—the treatment of those already sick or injured—the individual is of paramount importance. In preventive medicine, whether civil or military, the individual is of importance only in so far as he is the basic unit of any organization and in so far as unfitness in an individual may threaten the health and efficiency of the organization as a whole.

Disease in a military force is important only in proportion to its interference with the attainment of the aim of that force, and so the principal purpose of disease control is to keep as many men as possible fit for their duties. The importance of a disease and the value of its prevention or control are, therefore, measured by their influence on the non-effective sick rate and not on the morbidity or mortality rate. Thus a disease which, because of its high fatality rate or disabling consequences, may be of great importance in a civilian community or to the unfortunate individual concerned, may have very little influence on the effectiveness of a military force. On the other hand, diseases which are rarely, if ever, fatal but which render large numbers of men non-effective have a profound effect on the efficiency of the force and on the results of any operation on which it may be engaged. In other words, a hundred men dangerously ill or dying may be a less serious matter than two hundred who are just not sufficiently fit to do their duties.

Limitations

Preventive measures which would be necessary and practicable in other circumstances may, under military conditions, be quite impracticable because they interfere with the attainment of the military aim to an extent greater than the conditions which they are designed to correct. Thus, for instance, isolation of contacts of a case of infectious disease would be out of the question at a time when a force must be held in immediate readiness to go into action at the maximum possible strength. Similarly, the occupation of a very unhealthy site, that would never normally be tolerated, may have to be accepted for tactical reasons. This factor, as well as community life with close contacts between individuals and the primitive conditions under which men must live in the field, imposes limitations on the practice of military, as distinct from civilian, preventive medicine over which, however, it normally has the advantages bestowed by organization, discipline and, in time of war at least, priority of supplies.

The Demands of a Mechanical Age

The rapid development of the technical machinery of war during the present century has made new demands on military preventive medicine. During this period scientific and medical progress has been no less rapid and almost all those communicable diseases which have had the power to defeat armies in the past have been controlled. At the same time the individual has become more important. The man who, fifty years ago, needed to be fit enough only to march, sit a horse, wield a sword or fire a gun must now have the mental and physical qualities necessary to control and maintain highly complicated and dangerous machines.

Fifty years ago Smith, Brown, Jones and Robinson were soldiers and, if one fell sick, any of the others could replace him. Today Smith may be a pilot, Brown a radar mechanic, Jones a navigator and Robinson a fitter. If one falls sick none of the others can replace him.

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Today, therefore, in addition to controlling and preventing disease and maintaining a low non-effective sick rate, preventive medicine must concern itself closely with the ability of each man to perform the special task allotted to him and with the protection of that man from the peculiar risks inherent in that special task. This is a branch of medicine which has already made great advances in industry where it has not only benefited the workman but has increased the efficiency and the output of the industry itself. Here, then, is a problem largely common to industrial and military medicine and parallel to the technical problems which the Services now have to share with industry.

In reviewing the progress and the present position of military preventive medicine it is therefore necessary to consider not only the extent to which a commander can now expect to be freed from the threat of embarrassment or even defeat by epidemic disease but, also, how far man's efficiency can be improved in the operation and maintenance of the machines he has evolved.

THE HISTORY OF MILITARY PREVENTIVE MEDICINE

Preventive medicine, as we know it today, has evolved almost completely during the last century. Its military counterpart is equally young.

Museums of Egyptian antiquities contain evidence that, five thousand years ago, surgeons were setting fractured limbs and using instruments not unlike those in use today. Physicians, more handicapped by superstition, the lack of any knowledge of physiology and the universal belief that disease was of supernatural origin and not, therefore, to be interfered with by man, were prescribing drugs and potions whose composition was empirical and whose effects were as likely to be harmful as beneficial.

With no knowledge of the cause of disease or of the structure or function of the human body, the idea that disease might be prevented—and, still more, how it could be prevented—was still unconceived. Such measures as were adopted centuries later were empirical in origin, and those that were appropriate and successful were probably the result of shrewd but lucky observation of a system of "trial and error." Thus malaria was controlled to some small extent by avoiding low-lying, swampy areas; and thus was typhus fever eventually almost completely eradicated in this country by general cleanliness, long before the mosquito or the louse were incriminated or even suspected.

The "Sacerdotal Obsession"

Little real progress was made until the nineteenth century. The impenetrable cloud of what Sir Arthur Newsholme has called the "sacerdotal obsession" lay over the world and prevented any ray of scientific truth from illuminating the dark subject of disease. The belief in the supernatural origin of all disease has, throughout history, been encouraged—and often brutally enforced—by priests of all religions who realized that their power and worldly fortune depended on universal ignorance and who, therefore, did all they could to foster superstition and prevent research.

Nevertheless, a ray of truth occasionally pierced the cloud. One resulted in the sanitary laws of Moses, empirical and inadequate as they were. Another produced the teachings of Hippocrates, another those of Galen. Others gave the world the principles of Arabic and Saracenic medicine. But the cloud thickened again and these truths remained hidden and undeveloped until it was finally dispersed for ever by the great scientists of the past few centuries.

Although, as long ago as 1000 B.C., armies had their attendant surgeons, these did nothing but attend the wounded. During their conquests in the seventh and eighth centuries, the Mohammedans practised fumigation and segregation in dealing with contagious diseases but the fatalistic teaching of Mohammed prevented any real progress. In the face of the disastrous epidemics that continually decimated campaigning armies, precipitate flight was the only resort and this merely served to spread the epidemic far and wide.

The Effect of Discipline

The Crusades showed how discipline protected armies to some extent against epidemics—a fact that had already been suggested by the relative freedom from disease of the well-disciplined Roman armies as compared with the undisciplined mercenaries of the Carthaginians. The rabbles that composed most of the crusading armies were, one after the other, decimated by plague, dysentery and scurvy. The third Crusade, led by Barbarrossa and Richard Coeur de Lion, was a well-led and well-disciplined force in which personal cleanliness was aided by the employment of a corps of laundresses who accompanied the army. This Crusade avoided defeat by disease for longer than was customary in those days but was, finally, almost wiped out by plague.

The Seventeenth Century

The first real advance in medicine occurred in the seventeenth century. At last scientific enquiry was beginning to escape from the

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clutches of superstition and the discoveries of Harvey, Leeuwenhoek, Jenner and Malpighi became possible. But even at this time Harvey's publication of his discovery of the circulation of the blood was delayed for fear of imprisonment and whipping, which were still liable to be the lot of the authors of heretical views.

By now the British army employed paid surgeons and assistants. Hospitals, which probably caused as much sickness as they cured, had become a recognized part of the organization of an army.

1750-1800

The second half of the eighteenth century found a general recognition of the possibilities of the prevention of disease although the methods employed were still quite unscientific. In 1750, Munro had published his "Means of Preserving the Health of Soldiers," and, two years later, Sir John Pringle, who has been called the Father of Military Medicine, had produced his "Observations on the Diseases of the Army." The former work discussed camp sanitation and the purification of water. The latter was the result of very careful and acute observation of dysentery and typhus fever on the continent of Europe.

Pringle regarded "putrefaction of the air as being, of all the causes of sickness, the most fatal." He described how disease might be conveyed by "putrid air" and condemned overcrowding in camps and hospitals. He attributed dysentery to the air arising from "the corrupted water of marshes" and from excreta lying about the camp. "In the dysentery season," he wrote, "some slight penalty should be inflicted on every man that shall ease himself anywhere about the camp except in the privies." At a time when bacteria were undreamed of and when the "carrier," the foodhandler and the housefly were not suspected of their part in the spread of disease, Pringle's views and advice were remarkably astute.

By this time the Navy had made some notable advances in the prevention of disease. Captain Cook had already shown how scurvy, which, throughout history, had taken such a heavy toll of life on every long voyage and in many land campaigns, could be prevented and, as long ago as 1617, John Woodall had described the "juyce of Lemmons" as being "a most precious medicine." But it was not until 1794 that antiscorbutics were made a general issue in the Navy. By 1781 James Lind had prevented much typhus fever in ships by cleansing newly impressed men before they went on board.

Largely as the result of Sir Gilbert Blane's efforts, reforms were made in naval clothing and in the general cleanliness of the men's quarters. The purification of water by quicklime was introduced in 1780 and, in 1782, soap was issued. In 1781 Blane presented a memorandum to the Board of Admiralty on the subject of preventing sickness and mortality among seamen in the West Indies and recommended weekly inspections and reforms in naval rations. In 1799, Thomas Trotter advised that sailors' bedding should be "scoured" periodically, but the cost of sixpence for treating a pair of blankets was held to be prohibitive. By this time vaccination was being generally practised and was resulting in a dramatic reduction in sickness and deaths from smallpox.

The Realization of Executive Responsibility

In his "History of Tropical Medicine" Sir Harold Scott says that, at this time, " the health of the soldier was not neglected, and it was not the medical officer that merited the blame for disaster when it occurred so much as the carelessness, neglect and want of thought in high places." On the other hand, it is of interest to find that both Lord Nelson and Napoleon were evidently well aware of the importance of trying to prevent disease and of their own executive responsibility in that respect. In a despatch to the Admiralty, Nelson wrote: "You will agree with me that it is easier for us to keep men healthy than for a physician to cure them"; and Napoleon, in his Maxims (No. 114) and in a letter written in 1813 to Marshal Eugéne, the commander of the I Corps, emphasized the necessity of choosing healthy camp sites and of avoiding marshes and "inundated meadows," adding that "in such places I should lose my whole army in one month." Napoleon had no doubt learned his lesson from his disastrous campaign of 1812 but, nevertheless, sickness was again to be the cause of his numerical inferiority and defeat in the Battle of Leipzig.

Their insistence on sending the great amphibious expedition to the island of Walcheren in 1809—it was no more than a gesture to Austria —in the face of repeated warnings by the medical authorities and despite the record of disasters that had overtaken similar ventures in the past, makes it plain that British military commanders were not yet disposed to avoid the disastrous effects of epidemic disease.

1800-1850

The first half of the nineteenth century saw only such progress as was possible while the ultimate cause of disease was still unknown and while the essentials to scientific discovery were still unavailable. Nevertheless, Sir Ronald

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Martin prepared schemes for new barrack and hospital accommodation and recommended placing barracks on hills, a reform which resulted in reducing the death rate in Jamaica alone by seventy-five per cent., although the true reason for this improvement was not known, for the connection between insects and the transmission of disease was still unsuspected.

In 1839, Sir Andrew Halliday initiated reforms in the selection of troops for service in the tropics and in the length of overseas tours. Edmund Parkes, Professor of Hygiene at the newly formed Army Medical School, was successful in procuring more floor and air space in barracks. Until this time the space allowed for hammocks was only twenty-three inches per man, and married quarters consisted of only one room quite irrespective of the size of the family. It is said that when he heard of the death of Parkes, General von Moltke said that every regiment in Europe ought to parade and present arms in honour of one of the greatest friends a soldier ever had.

1850-1900

By the middle of the nineteenth century the production of the first compound microscope and the discovery of the aniline dyes were preparing the way for the physiologists and the bacteriologists who were at last to enable the prevention of disease to be placed on a scientific basis. These years were illuminated by such names as Virchow, Pasteur, Loeffler, Lister, Koch, Metchnikoff, Behring, Kitasato, Manson and Ross. To these names should be added that of Florence Nightingale, not so much on account of her spectacular nursing and hospital work as because of her less known "Observations on the Sanitary Conditions of the British Army in India" which resulted in the setting up of a commission to consider the whole question of military hygiene.

During this half-century the stranglehold of superstition and religious prejudice was finally broken. It is not yet a hundred years, however, since the Presbytery of Edinburgh petitioned the then Home Secretary to "appoint a national fast on Royal Authority" as a preventive measure against an imminent recrudescence of cholera in Britain. Lord Palmerston's reply shows a refreshing sense of reality emerging from countless centuries of superstition. "The weal or woe of mankind," he wrote, "depends upon the observance or neglect of natural laws." Had this outlook been shared by the military authorities of this country at that time, our forces in the Crimea might have been spared some of their terrible sufferings and losses.

The Situation in 1900

The birth of the present century found preventive medicine firmly established as a science no less in the Services than in civilian life—in fact the causes and methods of control of several important diseases had been discovered by serving officers. Bruce had isolated the causative organism of Malta (now known as "undulant") fever while stationed in that island. Ross had described the life cycle of the malaria parasite and its transmission by mosquitoes. The United States Army medical officers Reed, Carrol and Lazear were just completing their proof of the transmission of yellow fever by the mosquito in Panama, a discovery that at once made possible the construction of the canal. The causative organisms of tuberculosis, diphtheria, plague, cholera, dysentery and typhoid fever had already been isolated and studied. At last research into the prevention and control of these diseases could be undertaken along scientific lines, but it was still too early for this research to have borne much fruit.

Serious attempts were made during the Boer War to apply the limited knowledge then available. Efforts were made to eradicate those faults in sanitation which could now be proved to cause disease and, in Sir Almroth Wright's new anti-typhoid vaccine, the principles of immunization were, for the first time, applied to troops in war. So ignorant, however, were officers and men of the principles and practice of the most elementary measures, so bad was the organization and so little co-ordination was there between the combatant and the medical branches of the army, that the newly acquired knowledge was largely wasted. Typhoid fever brought nearly 58,000 men into hospital and more died of this disease alone than were killed by the enemy. The war did, however, point a salutary lesson. Great wastage of life and manpower was nothing new in war but, for the first time, there was proof that it could be prevented if sanitary discipline could be enforced.

Progress in the Twentieth Century

The early years of this century found us still ignorant of the cause of many important diseases. The spirochaetes of syphilis, relapsing fever and Weil's disease and the germs of typhus fever, gonorrhœa, the paratyphoid fevers, food poisoning, scarlet fever and many other diseases have been discovered within the present century, and the means of prevention, control and cure have gradually followed. During this period advance has also been made in the development of measures to control whole groups of diseases which have a common method of spread.

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Diseases Spread by Food and Water.—General improvement in methods of sterilizing water and in conservancy, especially in the field, has nearly freed forces from the threat of the excremental diseases—dysentery, typhoid and paratyphoid fevers and cholera—as well as from various helminthic diseases such as bilharziasis, guinea worm and hookworm disease. Pasteurization of milk and control of the production, preservation and serving of food has almost completely prevented the occurrence of undulant fever, scarlet fever and septic sore throat, and have played an important part in the prevention of dysentery and the typhoid group of fevers.

Ventilation, Vitamins and Immunization.—Attention to ventilation, air conditioning, artificial heating and bed spacing has greatly lessened the risk of diseases spread by droplet infection — diphtheria, tuberculosis, cerebrospinal meningitis and the so-called childhood diseases. The discovery of the vitamins has at last enabled us to prevent the diseases which, only a generation ago, were a serious military risk and of which the chief are scurvy, pellagra and beriberi. The science of immunology has produced vaccines and other preparations which, though they may not of themselves entirely prevent, have greatly reduced the mortality of typhoid fevers, cholera, plague, typhus fever, yellow fever and tetanus.

Diseases Transmitted by Insects. — The demonstration of the insect transmission of disease and the study of the life history and habits of those insects have enabled us to go far in our defence against fleas, mosquitoes, sandflies, houseflies, lice, ticks, mites and tsetse flies, and thus in the prevention of plague, dengue, malaria, yellow fever, elephantiasis, sandfly fever, typhus and typhoid fevers, dysentery, relapsing fever and sleeping sickness. The suppression and cure of malaria by mepacrine was one of the most important factors in the defeat of the Japanese in the last war, and it has been said that, without mepacrine, the enemy could not have been prevented from over-running India. Two very important discoveries which have recently revolutionized insect control are the insecticide D.D.T. and a number of insect repellents such as D.M.P. which are used to impregnate clothing.

Venereal Disease.—Although never of very great military importance, venereal disease has, at times, caused considerable wastage of manpower. It has been suggested that the Germans deliberately left infected "bait" for our troops in in the last two wars. Complete prevention is theoretically easy but, prejudice and human nature being what they are, its application in practice is always difficult. Mechanical and chemical measures, the provision of alternative amusements and—most important of all—education have had considerable success. Modern methods of treatment have now reduced the period of non-effectiveness from weeks or even months to a few days—a fact which has certain obvious disadvantages.

General Supervision.—Lastly, the higher standard of general education and the great advance in humanitarian principles have resulted in transforming the life of the Service man within a generation. His food, accommodation, work, exercise, clothing and equipment are all constantly supervised and improved, and the effect on his health, although difficult to assess exactly, has been enormous. Kipling's "Tommy Atkins," and even Bairnsfather's "Old Bill," would hardly recognize themselves in their descendants of today, but the millions who have suffered and died of disease on the battlefields of history would justly envy them.

PREVENTIVE MEDICINE IN THE ROYAL AIR FORCE

The Royal Air Force has inherited the benefits resulting from the medical discoveries of the past just as it shares them with the other Services and the civilian community. But the Royal Air Force, in its short history, has made its own contributions to the general store of knowledge. Within five years of its formation Whittingham and Rook demonstrated the life history of the sandfly and the control of sandfly fever. Naturally, however, the protection of its personnel from its own peculiar occupational hazards has been the principal concern of the Service.

The Selection of Flying Personnel

Greater care in the selection of personnel for all the Services has been taken in recent years but since the earliest days of military aviation the necessity for especially careful choice of flying personnel has been realized for, by this means alone, is it possible to ensure maximum efficiency and minimum wastage of man power, equipment and training time.

The Evolution of Selective Tests

Physiological tests, designed to assess the physical fitness considered essential in flying personnel, are based on the pioneer work of Flack and Birley. The universal acceptance of the tests they evolved and the fact that these tests have needed no major modification testifies to the soundness of their work.

Aptitude tests, devised largely on a "trial and error" system, have had to be modified as indi-

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cated by reports on progress received from the flying training schools and in the light of advances in this comparatively new science. Errors in the past may have tended to reject some potentially good material, but this has been compensated by the elimination of bad material and the emphasis that has always been laid on quality has been completely vindicated.

About a third of those who fail to learn to fly fail through poor nervous and muscular co-ordination—" hamhandedness." The other two-thirds fail on account of temperamental unsuitability. Tests in use today eliminate most of the first category, but it is still not possible to detect more than a very small proportion of the second category. It remains to be seen whether the application of the latest psychological tests and methods of selection will achieve the success which is predicted for it.

The Care of Flying Personnel

As the perfomance of aircraft has improved, much research has been needed to enable men to withstand the effects of increases in speed, acceleration and deceleration, centrifugal force, altitude, cold and noise. The work has been co-ordinated at the Royal Air Force Institute of Aviation Medicine under the guidance of the Flying Personnel Research Committee.

Flying Personnel Medical Officers.—In order to gain personal experience of the problems to be solved, Flying Personnel Medical Officers have been employed for the past six years. These officers receive full flying training. Most of them have now completed several thousand hours and have a number of operational sorties to their credit. Flying every type of aircraft in service, they have been the means of preventing wastage of flying personnel and of increasing efficiency and morale. To them have been referred the practical aspects of problems of flying fatigue, night vision, escape technique—especially at high speeds and great altitudes—oxygen supply, "ditching" procedure, survival kits and rations, improvement of the "Mae West" and modifications to goggles and flying clothing. These and other problems have been the subject of many arduous and dangerous experiments in which two of these officers have lost their lives.

The Study of Injuries.—By the study of injuries sustained by various members of the crews of particular types of aircraft in crashes and of wounds received in air combat, it has been possible to suggest modifications to aircraft which, when adopted, have effected a reduction in casualties and an improvement in morale. Similarly, the study of injuries sustained in parachute descents has led to modifications in equipment and technique and in the selection and training of airborne troops which have also reduced casualties.

Problems of the Future.—Work is now going on to solve the physiological problems arising from flying at stratospheric altitudes and supersonic speeds. So long as military aircraft are manned the need for research will exist and the safety and efficiency of flying personnel will continue to be one of the most important aspects of preventive medicine in the Royal Air Force.

The Control of Occupational Hazards

The duties of personnel in several Royal Air Force trades subject them to occupational hazards analogous to those encountered in industry. If these personnel are to perform their duties efficiently and without harm to themselves, special precautions are necessary.

Doping.—The doping of aircraft was one of the first occupations found to be harmful if the fumes were inhaled. Regulations were accordingly made to ensure adequate ventilation and the periodical medical examination of persons so employed.

Radio-active Substances.—The materials used for painting the luminous dials of instruments are radio-active. They are dangerous to those using them if particles are inhaled or swallowed. In 1930 precautions were instituted to prevent this risk. It was five years before the Home Office issued regulations, based on the pioneer work done in the Royal Air Force, which made similar precautions obligatory in civilian industry. Similar risks attend the continued use of X-rays and comparable precautions are taken for the protection of radiographers.

Machinery, Oil and Grease.—Plant and machinery of many kinds are liable to be dangerous to operators who are not protected from the moving parts by guards or other means. Even the humble bread slicer occasionally amputated an unwary finger until a fool-proof guard was fitted. Many personnel are perpetually exposed to the irritating effects of oil and grease. Skin disease is a common result especially when, as on active service, washing facilities may be inadequate. The introduction of "barrier" creams has considerably reduced this risk.

Working Hours.—The length and cycles of working hours in the various trades are constantly reviewed in order to minimize strain and obtain maximum efficiency. As in civilian industry, output is often improved when working hours are reduced. Ventilation, temperature, lighting and noise are important factors in production and efficiency. Regular breaks in work-

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ing time and adequate undisturbed sleep for those on night duty are also important. These matters are of special importance to those employed on signal duties and in the case of women workers.

Diet and Nutrition

During the war years much work has been done by a team of nutritional experts and the results of their investigations and analyses have been acclaimed far outside the limits of the Services. The team worked in almost every part of the world where the Royal Air Force operated and carried out research into the effects of adequate and inadequate diets and, especially, of vitamin deficiencies. Special rations for aircrews and for personnel serving in countries where fresh food was scarce were introduced as a result of this work.

Prevention of the Spread of Disease by Air Travel

The risk of disseminating disease by air travel was appreciated as soon as intercontinental flights became possible. For the first time direct journeys were made between places separated by what had previously been impassable barriers of mountains or deserts which now no longer barred the passage of man or disease. Moreover, the speed of air travel enabled communication to be made between almost all parts of the world in less time than was needed for the incubation of the major infectious diseases. Thus a disease which would have declared itself during a sea voyage would not now develop until after arrival in a country which had in the past, perhaps, been free from that disease.

The danger of transporting insects, especially mosquitoes, into areas previously free from them and the disease they carry was emphasized by the severe outbreak of malaria that occurred in Brazil in 1930 and which was traced to Anopheles gambiæ—a most dangerous malarial mosquito—which had been imported from West Africa.

In 1933 the International Sanitary Convention for Aerial Navigation was ratified by all the principal nations of the world. This Convention, periodically revised, has so far prevented such disasters as might result, for instance, from the introduction of yellow fever into India. Although the Convention does not apply to military aircraft, its provisions have been observed by the Allied air forces during the war (when operational requirements made the application of preventive measures extremely difficult) and no serious dissemination of disease has occurred.

Medical examination of travellers, quarantine, certain obligatory inoculations and vaccination, sanitary precautions at airfields and the disinsectization of aircraft have been undertaken wherever these measures were applicable. This has been a responsibility of international importance and, in England during the war, the Royal Air Force has acted as the agent of the Home Office and the Ministry of Health in ensuring that the required precautions were observed. Proof of the wisdom of these precautions and of the extent to which they have been applied was provided by the transport of many thousands of prisoners of war, refugees, displaced persons and troops of many nationalities all over the world during the war with no serious outbreaks of disease.

THE PRESENT POSITION OF MILITARY PREVENTIVE MEDICINE

Present Capabilities

All the epidemic diseases of military importance can now be controlled and most of them can be almost entirely prevented. One group alone still retains its power to interfere seriously with military plans. With the exception of typhus and yellow fever, the diseases caused by viruses—truly called "ultramicroscopic" until the perfection of the higher powered microscopes of the past twenty years—remain largely uncontrollable. But, now that these viruses can be seen and can be cultured artificially on the very specialized media that they require, it is only a matter of time before these diseases, too, are brought under control. The majority, but not all of them, are spread by droplet infection. Those of military importance are influenza, poliomyelitis (infantile paralysis) and infective hepatitis (jaundice). Fortunately these are, to some extent at least, controlled by the general sanitary precautions which constitute our main defence against so many of the bacterial diseases. Meanwhile research goes on and it is not likely to be many years before these diseases are fully understood and controlled.

Apparent Failures

It may be asked how it was, if we claim to be able to control disease, that the success of campaigns in the last war, as well as in that of 1914-18, came to be seriously threatened by malaria and dysentery. In the answer to this question lies a fundamental principle of disease control—that the most complete knowledge of the measures needed is of no avail unless it is applied in the form of sanitary discipline. For this reason alone it is right that the health of a

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force should be the ultimate responsibility of the executive and not of the medical authorities.

If the campaigns of this century which have been affected by a high rate of sickness are critically examined, it will be found that the fault lay either in inadequate medical intelligence and supplies (as in the Macedonian campaign of 1916-18) or failure on the part of the executive to enforce precautionary measures which had been urged upon them. This occurred in the New Guinea and Burma campaigns of the last war and it was only after unit commanders had been threatened with severe disciplinary action if they had more than a certain proportion of cases of malaria in their units, that the malaria rate dropped from 740 to 26 per thousand and the ratio of casualties from sickness to casualties from enemy action fell from 121.1 to 19.1.

The Widening Scope of Preventive Medicine

The success achieved in the control of epidemic disease has enabled preventive medicine to widen its interests. The field now covered is so wide that there is scarcely any activity, on or off duty, that is not the concern of the medical officer and in which he cannot contribute to the efficiency of the Service and to the well-being of the individual. This wider interest has been justified by the maintenance of a sick rate that was little higher in war than it had been in peace. In 1941 and 1942 (the last years for which accurate figures are at present available) the sick rate for the Royal Air Force at home and abroad was lower than in 1940, despite the deteriorating physical standard of recruits, the continued strain of war, decreased food supplies and the increasing numbers of personnel serving overseas in unhealthy climates under active service conditions.

The Necessity for Co-operation

It can now be confidently asserted that never again need a commander fear that his plans will miscarry through the ravages of any of the classical diseases of war provided:

(*a*) The medical authorities are brought into the planning of an operation early enough and fully enough to enable them to plan their defence against the diseases liable to be encountered, to integrate it with the general plan and to give their considered advice.

(*b*) The necessary equipment is made available and is not mistakenly given an inadequate priority.

(*c*) The executive makes and strictly enforces orders based on the medical advice it receives.

For their part, the medical authorities must make their aim always contributory to that of the commander, must be prepared to adapt their plans to the strategical or tactical requirements and must ensure that their advice is practical as well as technically sound.

The need for co-operation in the fight against disease is a reminder that the Principles of War themselves cannot be applied effectively by a force that is weakened by sickness. Even if the Aim is maintained, Concentration is impossible and full Co-operation with other arms and forces cannot be complete; Offensive action must be curtailed or postponed; Mobility is hampered by large numbers of sick to be accommodated and transported and, without mobility, Surprise can hardly be achieved; a high rate of sickness is the antithesis of the Economy of Force, and depletion of the force may well threaten its Security.

CONCLUSION

If the age-old sanitary laws and the recently acquired knowledge of disease prevention are ignored, and if there is failure to enforce orders based on them, then disease will continue to undermine the efficiency of forces in war.

To a nation which will always inevitably be faced with the problem of limited manpower and, particularly in any future war in which chemical and biological methods must be expected and anticipated, preventive medicine will be, more than ever before, a vital weapon demanding high priority in research, development and practice.

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The Effect of Technical Developments on the Royal Air Force

By Group Capt. W. E. Oulton, D.S.O., D.F.C.

THE APPLICATION OF ARMED FORCE

SOMEWHERE back in the misty past, before history began, a very primitive man one day stood menaced or robbed by an unfriendly neighbour of superior physique. Instead, however, of retaliating by an animal-like assault, using the standard tooth-and-nail or hand-to-hand technique, our hero retired to a discreet distance. He there selected a boulder of suitable size and shape, and hurled it against the aggressor. By good fortune, perhaps, he scored a hit on his opponent's control centre, thereby rendering him incapable of sustaining any further war effort. The moral was obvious—even to our very primitive man. Once negotiation has broken down and resort is made to armed force, then the aim and object is simply to deliver the right kind of missile at the right time and the right place. Beyond that, nothing whatever is gained by exposing one's own strength—personal or national—to danger or casualties.

Despite the incentive supplied by the struggle for existence during succeeding centuries, the lesson of the right missile at the right place and at the right time has not always been kept in mind as well as might have been expected. Perhaps because of the difficulties attendant on technical development of suitable missiles, mankind has spent a great deal of effort on trying to improve methods and means of hand-to-hand fighting. The stone axe was turned to homicidal use, and was followed by bronze and iron hatchets and the hand-held spear. The Roman short sword had its successes against technically inferior opposition and no doubt did much to encourage belief in the virtues of hand-to-hand combat.

A thousand years later, heavily armoured gentlemen lumbered towards one another until they reached an operational range comparable to that of the Roman infantryman, and then endeavoured to puncture each other's armour and anatomy with enlarged meat-skewers. Even another thousand years later, in 1916, many respected leaders of military thought contended that personal assault with the bayonet was the best and only means of winning a war!

All such methods of fighting involved serious losses to one's own force in inflicting losses of something like the same order on the enemy. It was sheer unimaginative brute strength against brute strength, and as the world's soldiery century by century began to require more expensive training and more expensive equipment, and bigger wars involved vastly greater losses of life, such methods of combat became insupportably uneconomical.

From time to time, however, some military genius would revert to the ideal of providing a suitably effective missile at the vital point and at the crucial moment. The results were usually markedly effective. For instance, boulders rolled over the battlements of a besieged fort had most satisfactory effects on the attackers below, at no cost to the defenders. The invention of the bow and arrow enabled man to inflict mortal damage at much greater range than ever before, and also to carry out "strategic" incendiary attack on vital stores. For heavier opposition, the Romans introduced the catapult, which was a very effective weapon in its time, although later it was lost in the ruins of the Roman Empire.

In the thirteenth century, powder rockets were first used in military operations, and reached a very effective stage of development in Congreve's rockets of the nineteenth century. At the same time the gun had been developed as a means of producing a suitable missile at a given target, and, by the beginning of the present century, had reached a state of efficiency well ahead of any other weapon. But the gun and rocket each had that one aim—to deliver a suitably lethal missile to the chosen target at a selected time.

The invention of the aeroplane immediately extended the possibilities inherent in the primitive technique of dropping boulders or buckets of tar on to the heads of the enemy below. The range of the new weapon, the aeroplane-cum-bomb, was such that far-sighted military leaders like General Smuts soon developed the idea of using a missile in a strategic role, as opposed to a tactical role. This involved no change in the concept of that ideal weapon capable of delivering the right missile to the right place at the right time. But the increase in the range of the latest approach to the ideal weapon enabled the latter to be used in strategic attack.

THE NATURE OF AIR POWER

In the two great wars of this century, weapons of all kinds have increased greatly both in range and destructive power. Even so, the gun was still limited to a range of something less than twenty miles. The most effective and distinctive weapons were those which were carried in an aircraft to the vicinity of the selected target, and there delivered with the assistance of the force of gravity. The main difficulty in the successful use

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of such weapons has been not the problem of launching from the correct position, but the difficulties inherent in transporting the weapon to a suitable point for launching. This latter process has entailed a preliminary battle to get past the defence and therefore the preliminary creation of strong air forces. As a result, many people erroneously regard the aeroplane itself as the prime weapon. This is not so, for it is the bomb, rocket or bullet which is the real weapon; the aeroplane is merely a means of transport and a suitably located launching platform.

During the critical phases of the late war, air power played a decisive role. In order to win the victory, we and our allies had to create vast fleets of aircraft of various types, to provide crews for them and to use them against the enemy in the air and on the ground. Through the operation of these air forces we were able to cut down the enemy's ability to continue the fight and materially to incapacitate the opposition to our ground forces engaged in the reoccupation of Europe and the Far East.

But what was this thing called "air power"? The mere possession of large numbers of aircraft and brave, well-trained aircrew, the stately manœuvrings of vast air fleets, meant nothing in itself. Air power was simply the ability to deliver a sufficient number of adequately destructive missiles at selected points and selected times. Air superiority meant nothing more than that we delivered—or threatened to deliver—more and better missiles, more accurately, than could the enemy; and that in the end the enemy was unable to impede us in the air transport of missiles to suitable delivery points in whatever quantity, quality, time and place might be required by our commanders in the field. Aeroplanes in themselves were valuable only as transports. For both offensive and defensive purposes, their value will remain only for so long as they continue to be the most accurate, effective and economic means of delivering bomb or bullet to the required target.

We ended the late war with a well-balanced air force. We had a large heavy bomber force for the delivery of the heaviest and most destructive missiles to strategic targets. Our Tactical Air Force had achieved very great skill and effectiveness in operating with our ground forces against the enemy in the field. Weapons carried in aircraft complemented those operating on the ground. Our defensive fighters were able to deny to the enemy any satisfactory opportunity to deliver his missiles on to targets of his choosing. Transport squadrons moved men instead of missiles, and conferred undreamt of mobility on our armies. The whole picture of air power seemed so neat and tidy and complete.

But in 1945 two major events occurred in the history of warfare. They did not come early enough to enforce any drastic changes in the form of air power in the war just ending. They will, however, compel us to reshape entirely our ideas on warfare for the next three or four decades. The first event was the successful introduction by the Germans of the elementary long-range rocket known as V2. The second event was the successful production and use of the atomic bomb.

It was immediately apparent that a combination of these two new instruments of war would make it possible for a missile, many hundreds of times more devastating than anything previously contemplated, to be delivered to its required destination without any need for air transport for the greater part of its journey. It seemed possible that a small group of technicians, operating in a secure base within their home country, would be able to achieve more effective results in a few minutes than could a large strategic heavy bomber force in months of costly air attack. At this point in the history of weapon development the late war ended.

The Future of Air Striking Power and Bomber Command

The Armed Forces were rapidly reduced to near-impotence by the process of demobilization, and we are now faced with the task of recreating, from inadequate resources, a nucleus of military strength capable of making an effective contribution to world peace. The problem which now faces the R.A.F. is how best to reshape the pattern of our force in view of the advent of the long-range rocket, the atomic bomb and the strictly limited man-power available to us. The force to be created must provide a powerful striking force as a deterrent to aggression, and an effective defence to withstand an unprovoked attack.

For the next five or ten years, finance and man-power are certain to place over-riding limitations on our military policies. The development of long-range rockets and atomic warheads is sure to be a slow and expensive process, and there can be no immediate change in the general pattern of the Royal Air Force—unless, of course, another war intervenes. With engine and airframe developments, speeds and ranges will continue to increase and will compel modifications in the tactics employed in the late war; but there will be no sweeping changes in the form of air power. We shall of necessity continue to use heavy bombers for strategic offensive bombing; medium, light and fighter bombers for army support; day interceptors and night fighters for defence, and specialized aircraft for maritime

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operations. But these forces will entail simply improvements and developments of existing equipment. No radically new ideas are involved.

Although, for the time being, we can do no more than keep in existence a small but highly efficient nucleus of an "orthodox" air force of the current pattern, we must immediately start to plan the requirements and air staff policy for the R.A.F. of 1960. In that future force, the long-range rocket is almost certain to become our primary striking weapon. If we are wise, we shall cling to the ideal of requiring only to produce the right missile at the right point and not let our resources be dispersed on projects which, though useful in the role of commercial transport, are not relevant to the development of the most effective and economical striking force. There can surely be little doubt that the nearest approach to this ideal weapon in the foreseeable future will be the long-range rocket.

There are, however, many sceptics who regard the V2 as an advanced development rather than as an elementary model, and who claim that it will never compete with the heavy bomber either in range or in accuracy. It may, therefore, be appropriate to review recent rocket development in order to get some idea of what may be achieved in the near future. In the past, there have been two main schools of thought interested in rocket, or, more properly, reaction propulsion. The more popular group, ranging from the Chinese and Arabs of the 13th century through Congreve to the recent inventors of R.P., Katushka and the "bazooka," were interested chiefly in the use of powder rockets as a form of tactical artillery. Modern rocket weapons of this sort have achieved phenomenal successes, but they remain nothing more than tactical artillery.

A much lesser-known succession of pure scientists—not military engineers—have been working for the past two centuries on the possibilities of space travel and the problems of reaction propulsion connected therewith. It was the fruits of the work of these men which was seized by the Nazis and—within ten years—resulted in the V2.

Considerable theoretical research was carried out in Germany and Russia in the 19th century on the problems of astronomy and physics involved in space and travel, and some sound theory was evolved. In 1929 the German Rocket Society was founded to advance these studies by practical experiment and, as early as 1930, encouraging results were obtained from rocket-motors fuelled with liquid oxygen and gasoline. Despite the handicaps of lack of funds or official support, the Society had, by 1931, produced very elementary rockets—or repulsors, as they were called, which reached a height of over 3,000 feet. Mechanical and metallurgical problems, the chief difficulties, were being tackled with some success, when in 1934 the Gestapo impounded all equipment and records. Some of the more energetic members of the Rocket Society eventually reached America safely.

Ten years later, as we know, the elementary repulsor, weighing a few pounds and ascending to 3,000 feet, had grown to a forty ton weapon ascending to one hundred times that altitude, and with ranges of over 100 miles. Little more than half this progress in the next ten years would produce rockets capable of ascending to a height of nearly 500 miles, at which height they could circle the earth without any further fuel expenditure as planets, until redirected earthwards. This may seem fantastic, but it is a perfectly reasonable proposition. Pre-war calculations, borne out by V2 results, show that a rocket weighing only 140 tons, with a two-ton warhead, could be despatched to an altitude where it would circle the earth once every 100 minutes until directed down to its target. As far as terrestrial warfare is concerned, this would remove all limitations of range. There will be many who will dismiss the idea on the grounds of accuracy; but who, ten years ago, would have conceded the possibility of a predicted free flight by a rocket, launched from a square of concrete over 100 miles away descending on to London with the accuracy of the V2?—an accuracy already more than enough to be effective with an atomic warhead.

There seems no reasonable doubt that, within ten or fifteen years, long-range rockets could be produced to be launched from the United Kingdom to fall on any spot on earth, within the accuracy of the weapon. As to that accuracy, past experience leads us to believe that it would be adequate for war-heads of the lethal radius of the atomic bomb or a biological bomb, even without remote control. With remote control, at the risk of radio counter-measures, the accuracy of such a rocket should approximate to that of the present strategic bomber.

If the foregoing argument is accepted—and it is difficult to see how it could be refuted successfully—there can be no doubt that our strategic striking power of 1960 should be based on the long-range rocket; and the concept of the heavy strategic bomber, with its insatiable demands on our ever-inadequate man power, should be abandoned as soon as possible. We should plan now for the creation of a rocket force as the strategic offensive arm of the R.A.F. Such a force could be based mainly in the United Kingdom, with only enough dispersal to ensure security. This arm would replace the present

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heavy component of Bomber Command, but without involving any change in the Command set-up. The type of warhead to be used in the strategic force rockets may well be limited by international agreement; but as in the case of poison gas, we must prepare for all contingencies until such time as nations show themselves able to live in harmony with their neighbours. So, for the foreseeable future, it remains the duty of the R.A.F. to continue with the development of the most effective types of warhead for use in long-range rockets.

There may well arise considerable controversy on the question of which Service shall operate long-range rockets. No ruling has yet been given, but the R.A.F. was created primarily because of the need for a force which could operate in a strategic role, and it would therefore be very reasonable to allocate responsibility for long-range rocket bombing—the successor to strategic bombing by aircraft—to the Royal Air Force. No one Service has a monopoly of machine guns or cannon, and no doubt each Service will require to use heavy rockets in a tactical role. But where the intended operation is of a strategic rather than of a tactical significance, the responsibility should lie with the R.A.F.

The Future of Tactical Air Forces

The strategic striking force envisaged above is obviously intended only for employment in a major war, and in a fairly specialized role. The R.A.F. has commitments other than the strategic offensive, and all recent campaigns show the necessity for air intervention in the land battle. For close support of land forces, it is doubtful if long-range rockets will ever replace aeroplanes and the Tactical Air Force should therefore continue in something like its present form for as long as the retention of a field army remains our national policy.

As long as the United Kingdom continues in control of colonial and mandated territories, the R.A.F. will probably continue to carry the responsibility for policing and peaceful control of unsettled regions. In Germany also, control by air power—for the period of the occupation—will probably be the most satisfactory means of discharging our responsibility for peace in Europe. For both of these tasks an impressive force is required which, by mere continued demonstration of its presence, will sufficiently discourage rebellious sentiments and render resort to destruction unnecessary. If it does come to interdiction of towns or villages, then action by piloted aircraft would be more human and discriminatory than assault by guided missiles. For all forms of police duty, a force on the same pattern as the Tactical Air Force is likely to be most satisfactory.

Therefore, for Army Support and Police Duties we shall require to continue the Tactical Air Force in its present form. It is, however, interesting to note that the modern jet fighter looks like being too fast for use in a fighter-bomber role and we may well require fighters of limited top speed and greater manœuvrability for employment with Tactical and Police Air Forces.

Maritime Air Forces

Despite all developments in aviation, there seems little likelihood that the United Kingdom will ever cease to depend on surface sea transport for the import of food and raw materials. In time of world unrest our economic lifelines will continue to be the sea lanes and our shipping will almost certainly be once again menaced by air and submarine attack. It is almost certain that no enemy would ever deem it profitable to attack small merchant convoys with long-range atomic weapons and any future threat will again come from aircraft and submarines.

Technically, in maritime operations the attack is ahead of the defence, and immense efforts will be needed to counter very fast submarines operating with Schnörkel or some form of continuous air restoration. Similarly, the range of shore-based fighters has increased so much as to be a hazard to maritime aircraft operating in any section of any ocean.

Modern war is so very costly that any future aggressor is likely to try to knock us out in the first week or two, and is therefore unlikely to dissipate his efforts by attacking long-term targets such as shipping. Therefore our maritime Air Force must not be too high a proportion of our total air strength. All we need is an insurance premium. But such maritime force as we do have must be technically first-class. The greatest energy is needed in discovering adequate airborne search equipment for fast submerged craft and in providing a much greater scale of defensive armament. Our Maritime Command, by reason of its unchanging duties, will continue in much the same form as heretofore. But great improvements are required in equipment and technique.

Transport Command

Transport Command must continue as an integral part of the R.A.F., but recent technical developments are unlikely to have any marked effect on its function or organization. Provided that we have adequate numbers of the most up-to-date air transports both for close support work and for routine movement of personnel and stores, there is likely to be little change in the next ten or fifteen years.

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The Problems and Future Organization of Air Defence

After the sweeping changes proposed for Bomber Command, the continuation of old policies for Tactical, Maritime and Transport air forces may seem unenterprising. But with problems of air defence we are faced with considerations closely allied to those influencing our policy on the striking force, the over-riding factors being the long-range rocket and the atomic bomb. The defence has to deal with two main types of attack—long-range strategic assault and shorter range tactical offensives. Aggression in the future is almost certain to be secretly prepared, and in view of the difficulties inherent in the secret training of large numbers of aircrew, it is almost certain that such aggression will commence with strategic assault by long-range rockets. The warheads may, or may not be atomic bombs but they are certain to be devastating in effect.

The best defence against aggressors is, of course, a vigorous counter-offensive, but whatever may be achieved in this manner, our defence must be able to minimize the effects of the enemy's initial onslaught. In view of the extremely high speed of a long-range rocket, it will be quite impossible to make any effective interception by piloted aircraft, and our only hope will lie in some form of counter-guided missile which will home on to the rocket and destroy it or partially neutralize it before the target is reached.

Our main defensive weapon against future long-range assault must therefore be a small guided or self-homing rocket missile, of very high speed and initial acceleration, and capable of neutralizing in some way the warheads of approaching long-range rockets. At some future date Fighter Command should replace the majority of its fighter squadrons with counter-rocket units. Even more than during the past war, this defensive force must be supported by a very wide and highly developed radar organization for reporting, tracking and control of intercepting counter-rockets.

The minor threat from piloted aircraft operating in a tactical role at supersonic speeds will still exist. To counter this threat, we shall have to retain for some time a small force of day interceptor and night fighter squadrons. Such orthodox fighter squadrons should not, however, represent more than about a third of the strength of Fighter Command, and it may ultimately cease to exist as a defensive requirement. After all, a counter-guided missile capable of intercepting a heavy rocket should equally well neutralize an aircraft even when travelling at supersonic speeds.

A function which tied up many fighter squadrons during the late war—the escort of heavy bomber forces—will automatically cease to exist when all strategic bombing is done by long-range rockets. Fighter aircraft of the future will be limited to the defence of isolated strategic and tactical targets and to participation in tactical air forces.

Conclusions

The essence of the application of air power is the delivery of a suitable missile to the chosen target at the appointed time. During the late war, the most effective way of doing this has been to carry a bomb in an aeroplane to the vicinity of the target, there releasing the bomb. This method involved enormous overheads in manpower and wastage of material and human life.

Science has now made it possible for a far more devastating missile to propel itself from a secure launching base to remote targets and it is possible to remove all terrestrial limits to the range. We must take every advantage of this much nearer approach to the ideal weapon.

The logical inference from the foregoing is that our main striking force of the future must be built round the new weapon; the corollary is that our defence must be concerned primarily with neutralization of the atomic or other long-range rocket. Those elements of air power concerned with attack on small tactical targets, with intervention in a land battle and with transportation remain comparatively unaffected.

The following recommendations are therefore put forward for the reorganization of the R.A.F.:

(*a*) Bomber Command should be reconstituted as a long-range rocket force.

(*b*) Fighter Command should be reconstituted as a counter-rocket defence force, backed by a large radar and radio countermeasure organization. A small force of day and night fighters should be retained until further scientific developments render it obsolete.

(*c*) We should aim to complete this reconstitution of Bomber and Fighter by 1960.

(*d*) The Tactical Air Force should be developed along its present lines, including medium, light and fighter bombers and night fighters. It should be trained in both Army support and in air control of the colonial empire.

(*e*) Maritime air forces should be retained but with radically improved search equipment and much more effective offensive and defensive armament.

(*f*) Transport Command should continue as at present constituted, but with up-to-date aircraft.

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AIR OPERATIONS IN GREECE

HIGHLIGHTS OF THE AIR OPERATIONS IN GREECE

Units Taking Part

(For details see page 32 *et seq.* of Vol. 18, No. 1, R.A.F. QUARTERLY)

No. 11 Squadron (Blenheims).
No. 30 Squadron (Blenheim Fighters).
No. 33 Squadron (Hurricanes).
No. 80 Squadron (Gladiators).
No. 84 Squadron (Blenheims).
No. 112 Squadron (Gladiators).
No. 113 Squadron (Blenheims).
No. 208 Squadron (Hurricanes and Lysanders).
No. 211 Squadron (Blenheims).
No. 805 Squadron F.A.A.
No. 815 Squadron F.A.A.

Detachments of:
Fleet Air Arm, six Swordfish.
No. 37 Squadron (Wellingtons).
No. 38 Squadron (Wellingtons).
No. 70 Squadron (Wellingtons).

28th February, 1941.—In the biggest air battle fought over Albania, R.A.F. Gladiators and Hurricanes shot down twenty-seven enemy aircraft without loss.

Week ending 3rd March, 1941.—Thirty-three Italian fighters destroyed and a further eight probably destroyed, against which our own fighter losses were only one Gladiator, the pilot of which was safe.

9th to 14th March, 1941.—Our fighters destroyed thirty-five enemy aircraft and probably another nine for a loss of only two Gladiators and one Hurricane, the pilots of which escaped.

28th March, 1941.—The Battle of Cape Matapan, in which the R.A.F. bombing squadrons based on Greece took part and assisted the Mediterranean Fleet of the Royal Navy to bring the Italian Fleet to battle and defeat it (*cf.* page 35, Vol. 18, No. 1, R.A.F. QUARTERLY).

January to March, 1941.—During these three months our fighters destroyed ninety-three and probably destroyed another twenty-six enemy aircraft. Our own losses in combat were four Hurricanes and four Gladiators, from which six of the eight pilots escaped.

6th April, 1941.—First air engagement with German Air Forces over Greece. Twelve Hurricanes engaged twenty German Me. 109's and shot down five without loss.

9th to 15th April, 1941.—Our bomber squadrons successfully attack enemy lines of communications.

On the night of 14th/15th April, Wellington bombers created chaos at Velas and broke the bridge across the Vardar.

15th April, 1941.—German Air Force directed its main effort against our Air Force. At Niamata all the aircraft of one of our Blenheim squadrons were destroyed on the ground.

20th April, 1941.—Approximately 100 German dive-bombers and fighters in an attack on the Athens area were intercepted and engaged by fifteen Hurricanes (the total force of British fighters remaining in Greece) bringing down a total of twenty-two of the enemy confirmed and eight unconfirmed with a loss of five Hurricanes.

19th and 20th April.—During the period of intensive air activity, Hurricanes of Nos. 33 and 80 Squadrons destroyed twenty-nine German aircraft and probably destroyed another fifteen. Seven Hurricanes were lost and two damaged; a truly remarkable record in view of the disparity

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of strength between the R.A.F. and the German Air Force.

"Small as our losses were, they were crippling to our small force. Even after being shot down, our fighter pilots would immediately take the air in aircraft which had been riddled with bullets and by all normal standards were totally unserviceable. The courage of these men never failed nor looked like failing. Each day their fellows died, each day they stepped into their battered aircraft, not without a sensation of fear but quite undismayed. Each man was aware of his great responsibility in face of great odds."

End of April, 1941.—Blenheim fighter patrols operating from Crete gave effective air cover to the ships evacuating troops from the beaches. "These escorts were maintained throughout the evacuation without respite, and . . . due largely to their efforts . . . a large proportion of the total British forces in Greece were evacuated."

Sunderland flying-boats of the R.A.F. and B.O.A.C. carried out magnificent work ferrying parties of airmen and soldiers both from the mainland to Crete and from Crete to Egypt. The record number of eighty-four personnel was carried in one Sunderland on a single trip.

Statistics of the Air Operations in Greece

Combined strength of German and Italian air forces at commencement of these operations was 1,100 aircraft, of which 40 per cent. (440) were fighters. The total strength of the R.A.F. in Greece was 200.

Personnel evacuated by air from Greece to Crete totalled over 600, and those evacuated from Greece to Egypt, 870.

In the six months' campaign in Greece our total aircraft losses were 209, including 82 destroyed and abandoned by our own forces. Our total losses of aircraft missing in combat were 72. Losses inflicted on the enemy were 259 aircraft destroyed and 99 probably destroyed; of these 231 and 94 were in combat with our aircraft. Personnel losses amounted to 148 killed and missing and fifteen taken prisoner, making a total of 163, of which 130 were air crews.

THE following report was submitted to the Air Officer Commanding-in-Chief, Middle East, on 15th August, 1941, by Air Vice-Marshal J. H. D'Albiac, D.S.O., commanding the Royal Air Force in Greece:

In framing this report, my object is to describe the various problems with which we were confronted from time to time and how we attempted to solve them, our reasons for adopting certain definite lines of policy; the difficulties with which we were faced; our successes and failures; and finally to draw attention to some of the lessons we learnt in a campaign which, although perhaps not entirely successful in its highest conception, contributed materially to the prosecution of the war as a whole and formed a chapter in history of which the Royal Air Force may well be proud. I do not propose to compile a day-to-day record of all the activities of the Command. Apart from the immensity of such a task, an account of this description would not serve any useful purpose and would only tend to obscure those particular points which I wish to emphasize. Nevertheless, in order to obtain some form of continuity, it is necessary to deal with the campaign in chronological sequence. I propose, therefore, dividing it into three periods of two months into which arrangement the campaign conveniently divides itself from the strategical point of view.

November-December, 1940

Declaration of War

At three o'clock in the morning of 28th October, 1940, the Italian Minister in Athens handed to the Prime Minister of Greece a note from his Government complaining in strong terms of alleged Greek assistance to the Allies and demanding for the Italians the right to occupy certain strategic bases in Greece. General Metaxas regarded this note as an ultimatum which he promptly refused and a few hours later Greece was at war with Italy.

Unlike the Italians, the Greek forces were little prepared for war. Their regular army units were at their peace-time stations throughout the country and general mobilization had not been ordered. On being attacked, the Greek units holding the frontier posts on the mountainous borders of Albania, although fighting with the greatest gallantry, were overwhelmed in some cases by sheer weight of numbers and compelled to give ground. This was particularly the case in regions where conditions were suitable for the employment of Italian mechanized forces. The progress of the Italian army was, however, slow for although Italy had concentrated large forces on the Greek frontier, the firm attitude adopted by the Greek government came as somewhat of a surprise as it had been thought that all Italian demands would be met without resort to arms. It was confirmed also from the reports of

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prisoners taken in the first few days that the opening of hostilities was quite unexpected by the Italian soldiers themselves, who had been led to expect a diplomatic victory and a peaceful advance into Greek territory.

The Greek Problem

It was clear that the problem confronting the Greeks was largely one of time. Could her frontier units hold the Italian forces sufficiently long to enable her armies to be mobilized and concentrated? As is well known, Greece is badly served by communications. Roads and railways on the mainland are few in number and the former are in most cases bad. A number of her reservists had to come from the Greek islands and it was estimated that it would take at least three weeks for the Greek mobilization to be completed and for sufficient forces to be concentrated in the battle area before she could really consider herself reasonably safe. In the meantime, the Italian air force could, if handled properly, play havoc with their mobilization and concentration arrangements. This, for some unaccountable reason, the Italians failed completely to do and wasted their comparatively strong air force in abortive attacks on undefended islands and hospitals in Salonika.

The Greek Air Force

The Greek Air Force, although small and outnumbered by the Italian, fought most gallantly during this initial stage. Their pilots, many of whom had attended courses in England at the C.F.S. and elsewhere, were keen and what they lacked in modern war technique they made up for in personal bravery. Their aircraft, like those of most small independent nations not possessing an aircraft industry of their own, consisted of a number of different foreign types, French and Polish predominating, with a limited range of spares.

Operationally, the Greek Air Force was controlled by the General Staff and was used almost entirely in direct support of their army. They were quite unable to obtain any degree of air superiority and in consequence they suffered severe casualties. In addition, owing to the difficulty of obtaining spares, an abnormally high proportion of unserviceability soon existed, and in a comparatively short time their effort was reduced to negligible proportions.

Decision to send an R.A.F. Contingent

In response to an urgent appeal for help, the British Government decided to send a contingent of the Royal Air Force to Greece from the Middle East. The force decided upon was to consist of two medium bomber squadrons, one mixed medium bomber and two-seater fighter squadron—all armed with Blenheim aircraft—and two single-seater fighter squadrons armed with Gladiator aircraft. On my arrival in Athens on 6th November, 1940, the advance elements of this force had already arrived and were ready for action.

Air Policy

That evening I attended a conference with the Prime Minister and Commander-in-Chief to discuss the war situation generally. Every pressure was brought to bear on me to employ my force in the same manner as the Greek Air Force, in close support of the land forces. I appreciated, however, that the best help I could give to the Greek armies was to concentrate my small bomber force on the enemy's disembarkation ports in Albania and the important centres in his lines of communication. I argued that such a plan would do far more to delay his advance than if I attacked his forward elements. If, however, the situation deteriorated considerably, and a break-through occurred, I would of course devote the whole of my force to the immediate task of stemming the enemy's advance. I finally obtained agreement on this policy and attacks were directed forthwith on the enemy's back areas. These attacks were maintained at maximum intensity with the few day bomber aircraft at my disposal and the detachments of Wellington aircraft sent over from Egypt to operate during the periods of moonlight. By the end of November the Italian advance had been stemmed and the Greek forces who had by then completed their concentration were able to take the offensive. The Greek General Staff were most appreciative of the prompt and valuable help we had been able to provide for their gallant soldiers who, with ferocious intensity, had disputed every foot of the Greek soil, and they expressed the view that it was largely due to our assistance that the situation had now become satisfactory.

Selection of Aerodromes

One of the main difficulties I experienced in establishing my force and one which was a constant handicap throughout the whole campaign, was the extreme scarcity of aerodromes suitable for the employment of modern aircraft. There were no all-weather aerodromes, and on the mainland of Greece there are few areas in which aerodromes of any size can be made. In the Salonika area, the country is flat and a number

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of dry-weather aerodromes already existed. For political reasons, however, I was not even allowed to reconnoitre these grounds, let alone use them. In the Larissa plain there were many sites possible but by November the rains had already commenced and, although I did station a fighter squadron in that area on its arrival, it was soon flooded out and aircraft were grounded for a period of ten days before they could be moved. There are few other sites in Greece except for an occasional flat stretch on the coast and a certain number of level areas in the valleys, but the heavy rainfall and the prevalence of low clouds and mist make the latter quite unsuitable for operational purposes during the winter months, at any rate for modern bombers. I was forced, therefore, to concentrate my bomber force on the two aerodromes in the vicinity of Athens, and station my fighter squadrons on whatever grounds I could find near the front line, where they had to operate under conditions of the greatest discomfort and difficulty.

The main disadvantage of the aerodromes near Athens was that they were a long way from the front and it meant long hours of flying to and from the targets. They were, however, better drained and were only out of action for a few days after heavy rain. Furthermore, being near the sea, they were not so liable to get completely covered in by low clouds. Criticism has been made that the initial force which was sent to Greece was inadequate and many more squadrons should have been provided. I should like to point out, however, that even if these squadrons had been available, which they were not at the time, the lack of suitable aerodrome accommodation would, in my opinion, have prevented us from accepting them. During my first week in Greece, I made a tour of all possible sites, and on my return pressed the Prime Minister to undertake immediately the construction of all-weather runways at Araxos and Agrinion. I pointed out to him the operational disadvantages of the existing situation and that, unless suitable runways were provided near the front, the support that we could give to the Greek nation during the winter months would be severely limited. He agreed fully with my recommendations and arranged for the construction of runways to proceed immediately. After consulting with the head of the department concerned, he informed me that the runways would be completed by the end of January, 1941. (NOTE.—Unfortunately, owing to weather conditions and shortages of material, this forecast proved over-optimistic, and neither of these was ready for use when I left the country at the end of April.)

Arrival of the Force

Units of the force continued to arrive throughout the months of November and December, and by the end of the year the concentration was complete and the whole command functioning smoothly. When the composition of the force was being considered in the Middle East, it was decided that all the ancillary services such as hospital, works, rationing, etc., should be provided by the Army, with appropriate Army officers on my Headquarters staff to deal with them. This arrangement was particularly successful. Although, even in our respective Services, few of us had served together before, officers of this combined staff soon settled down and worked with the greatest enthusiasm and co-operation. This happy atmosphere which existed at the top had, I consider, a beneficial effect on the relationship between the operational units and the actual Services themselves in spite of countless difficulties occasioned by weather and terrain. Similarly, the liaison that existed between the British forces in Greece and the Greeks was at all times close and cordial. Every evening I attended a conference with the Commander-in-Chief and the Greek General Staff to discuss the day's land and air operations and to plan the programme of work for my force and for the Greek air force for the following day. These nightly meetings which were attended frequently by His Majesty the King and General Metaxas, when matters of higher policy were freely discussed, were carried on throughout the whole of my stay in Greece and were invaluable from a co-operation point of view.

Progress of Operations

As regards the actual operations themselves, the Greeks had by now taken the offensive on land and, although handicapped by severe weather conditions and shortage of equipment, had managed to drive all the Italian forces off Greek territory and in some sectors had even advanced into Albania. In the air, our continued bombing offensive against the ports of Valona and Durazzo and the focal points on the enemy's rearward system was having a serious effect on his supply organization. In addition, during moonlight periods, our bomber effort was being extended to targets on the mainland of Italy by means of Wellington aircraft detached from Egypt for the purpose, and considerable damage was being inflicted on ports on both sides of the Adriatic. Similarly, our fighter aircraft were establishing a definite atmosphere of moral if not of numerical superiority in this theatre.

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JANUARY-FEBRUARY, 1941

Operational Difficulties

The new year opened with a deterioration in the weather conditions. Heavy falls of snow and much low cloud made flying conditions difficult and dangerous. A further handicap now appeared in the form of severe icing conditions which were experienced by our aircraft over the mountainous country between their bases and the targets in Albania. To avoid this serious state of affairs, we were forced to route our bomber aircraft by way of the coast. Over the sea, the flying conditions were considerably better, but this longer route limited the operational radius of action of our aircraft and militated against effecting surprise. Furthermore, enemy aircraft opposition was now becoming increasingly stronger, and large numbers of modern enemy fighters were being encountered constantly over the targets. These reinforcements were undoubtedly being brought over in an effort to reduce the scale of our attacks on the enemy's rearward communication system, which were obviously causing him growing embarrassment. Whilst it was comforting to think that our bomber offensive was presumably having the desired effect, this addition to the enemy's fighter strength increased considerably our operational difficulties. It was now necessary to make full use of cloud cover and to adopt a system of fighter escorts for our day bomber raids if heavy casualties were to be avoided. Our lack of modern fighter aircraft and the difficulties encountered in arranging for bombers and their escorts to meet, owing to the distance between our bomber and fighter aerodromes, badly connected by communications, with weather conditions constantly changing, all tended to reduce the operational effort of my bomber force and it became increasingly obvious that, until the fine weather came and more aerodromes were made available, there would be little opportunity for any decisive action on our part.

I would here like to pay a tribute to the magnificent spirit in which the pilots and air crews carried out their work during an exceedingly difficult period of operations. Based as they were in the Athens area, every raid carried out by the bomber squadrons involved a preliminary flight of at least 200 miles to the theatre of operations in weather conditions which were at times quite indescribable. Throughout the journey the pilots and air crews were fully aware that they would meet strong fighter opposition over the targets, and would have to engage the enemy before they were able to deliver their attacks. The number of lucrative targets in Albania was strictly limited and the Italians had by this time been able to concentrate a high scale of anti-aircraft artillery to defend them, and it was seldom that our aircraft came through unscathed. Having carried out their task, the long and arduous journey home had to be completed. Direction-finding aids existed, but the very nature of the country made their results unreliable and much had to be left to the skill, judgment and determination of the individual pilots. In spite of all these difficulties, however, squadrons cheerfully accepted all the tasks I gave them and maintained a scale of effort far beyond that which is normally expected from Service squadrons working under more favourable conditions. This same spirit prevailed in the fighter squadrons which were operating from forward aerodromes in conditions of extreme discomfort. Although outnumbered and armed with aircraft inferior in performance to those of the enemy, the pilots never hesitated to give battle whenever the enemy appeared.

Reinforcement Plan

Early in the new year I visited Cairo in order to discuss the question of reinforcement which was then under revision. Operations in the Western Desert were being brought to a successful conclusion and it was hoped that, by the time the weather conditions had improved in Greece so as to allow occupation of more aerodromes, it would be possible to spare additional squadrons from the Middle East Command. The reinforcement plan envisaged a total force in Greece of fourteen squadrons and I intimated that I would be prepared to start accepting the additional squadrons by 15th January. It was hoped that the whole programme would be complete by 15th April. In planning the reinforcement programme, I again endeavoured to get permission to use the aerodromes in the Salonika area, some of which had remained generally servicable throughout the winter and could be occupied forthwith. The Germans, however, had commenced their infiltration into Roumania, and the Greek Government were particularly anxious to avoid giving them any idea that we had any hostile intentions in Macedonia which could be directed only against German interests.

The Greek Air Force

As I have stated already in this report, the Greek Air Force had suffered severe casualties in the early stages of the war, and by the end of the year it was reduced to a mere token force of a few serviceable operational aircraft. Promises of the provision of modern fighter aircraft had been received from the U.S.A., and the British Government had agreed also to supply aircraft

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as and when they became available. Whilst admiring the *esprit de corps* and enthusiasm of the officers and airmen of the Greek Air Force, I considered that operationally they had a lot to learn before they would get full value out of really modern aircraft. Similarly, from the maintenance point of view, a considerable amount of reorganization was necessary before they would be able to maintain a reasonable degree of serviceability. As these American and British aircraft would be provided presumably at the expense of the R.A.F. reinforcement or expansion programme, I was determined to do all I could to ensure that full use was made of them. I had previously discussed the whole problem with H.M. the King of Greece and the Prime Minister and had made the suggestion to them that a British Mission of qualified R.A.F. officers and airmen should be appointed to help them in the reconstruction of their flying service. They welcomed the suggestion and in due course a mission was provided, and the work of reorganizing the Greek Air Force on modern lines was commenced. In addition to their primary role, the Mission undertook also to reconnoitre and supervise the work on all the new aerodromes which it was desired to use in spring, and much valuable work they did in this respect.

Offer of British Expeditionary Force

Early in January, conferences were held to discuss the possibility of sending a British expeditionary force to Greece, but the Greek General Staff, on learning the limited size of the force that could be made available at the time, decided that its presence would only tend to provoke Germany, whilst it was not strong enough to be able to provide any very material support.

Battle for Valona

The Greek General Staff now realized that, if as seemed probable the Germans intended to make a move through the Balkans, they might be faced in the spring with a campaign on two fronts. They therefore considered it essential that every effort should be made to bring the Italian campaign to an end before such an eventuality arose, or at any rate to shorten their front in Albania as much as possible so as to have troops available to strengthen their front in Macedonia. They appreciated that an advance to a line north of Valona would certainly accomplish the latter and might conceivably, in view of the low morale of the Italians at that time, achieve the former. Consequently, early in February, the Greek armies in Albania started a fierce offensive in the direction of Valona. The preliminary attacks were successful and a certain amount of progress was made. Bad weather, however, intervened and, although the Greek soldiers fought with their customary heroic disregard of danger, the Italians were able to bring up reinforcements and the advance was held up just north of Tepelene.

Change of Air Policy

This battle for Valona is interesting from the air point of view inasmuch as a change of policy was forced upon us. Hitherto, my bombing offensive had been directed almost entirely upon lines of communication, ports and aerodromes to the rear, and with the limited means at my disposal was, I think, instrumental in reducing the flow of reinforcements and supplies to the Italian armies in the field. When discussing this new operation both with His Majesty the King and the Commander-in-Chief, they stressed the vital importance of a success, particularly as the morale of the nation had recently been badly shaken by the death of their Prime Minister, General Metaxas. They pointed out that the Greek soldiers on the front had experienced a severe winter and, although full of fight, were not too well off for munitions and supplies. Consequently, it was essential that they should have the utmost encouragement and support that could be provided. This could best be given by my bomber force being used in close support of the Greek attack. I produced all the stock arguments against this form of co-operation, and stressed the fact that by bombing enemy communications leading to the battlefield a greater degree of help would be given to their troops fighting the actual battle. However, they reminded me that the morale of some of the Greek soldiers had been shaken severely by enemy bombing attacks, and that the success of the whole operation might depend on the stimulus afforded by seeing the Italians treated in the same way. I therefore acceded to their requests.

Reorganization of Command

It was obvious that, if successful close support was to be provided, a certain reorganization of my forces was necessary. It was quite out of the question to attempt to keep in touch with a fluctuating battle in Albania from a headquarters in Athens, and if immediate and constant support was to be given, my aircraft must operate nearer the front. Accordingly, I formed a wing headquarters in the area of operations, and moved part of my bomber force to a landing-ground which was found to be sufficiently dry close to the front. For the first few days, until road communication could be established, this landing-

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ground was provisioned by air. I delegated the command and operation of all the bomber aircraft engaged in this operation, and a fighter squadron, to the commander of the wing, who was in constant touch with the Greek commander conducting the land operations. From a purely local and spectacular point of view, this form of co-operation was an instant and complete success. The morale of the Greek soldiers was raised considerably and I received fulsome praise and appreciation of the work carried out by the pilots. I was even approached by one divisional commander who implored me to order my pilots not to fly so low over the Italians for fear they would be shot down. Our efforts were made much of in official communiqués, and I think that, during this particular period, the prestige of the R.A.F. was higher in the minds of the Greek nation than at any other period during our stay. I felt the whole time, however, that this high regard was based on false premises for, although we were invigorating our friends, we were misemploying our aircraft. Later events proved this to be the case. If the weather had been kinder the Greeks might have succeeded in attaining their objective, but heavy falls of snow and rain held up their progress, and early in March the Italians who had been able to assemble reinforcements, staged a heavy counter-attack which, although held by the Greek forces, destroyed all hopes of capturing Valona.

Actually, even if we had employed our bomber force solely on ports of disembarkation in Albania, I doubt very much whether we could have interfered to any great extent with the flow of Italian reinforcements. Our available bomber force was small, the weather was bad, and it was clear that, after their recent defeat in Cyrenaica, the Italians were determined to avoid another reverse which might have had disastrous results on the nation as a whole. Freed from the necessity of supporting their North African front, they had the troops available, and under the conditions prevailing at the time it would have been difficult to prevent their arrival in Albania.

Arrival of Hurricane Aircraft

During the latter part of this period an event of considerable importance concerning our fighter strength occurred. The first six Hurricane aircraft appeared in Greece. Up till now the pilots in our two fighter squadrons had been doing grand work with their Gladiators, but with the gradual appearance of faster and better types of Italian aircraft, they were finding themselves at a disadvantage, and their re-equipment with a more modern type was most welcome. The first appearance of these well-known fighter aircraft over Athens was greeted with the greatest enthusiasm by the local population and it was not long before they justified fully their reputation of being first-class fighting aircraft. On their first sortie over the lines on 20th February, they shot down four enemy aircraft, and on 28th February, in company with a formation of Gladiators, destroyed twenty-seven enemy aircraft without a single loss to themselves. This fight, which was the biggest ever fought in the air in Albania, was staged over the Greek lines in full view of both armies. All the enemy aircraft destroyed were confirmed from the ground and caused the greatest jubilation.

MARCH-APRIL, 1941

Decision to send a British Expeditionary Force

The opening of this final phase of the campaign in Greece was notable for the decision taken at long last to send a British expeditionary force to the country. The Germans had by now completed their subjugation of Roumania and were repeating their customary penetration tactics this time into Bulgaria. The usual stories of the arrival of tourists and reports of preparations being carried out on aerodromes and lines of communication had been coming in for some time, and it was all too clear that it was only a matter of time before the German armies would be ensconced on the Greek northern frontier. The attitude of the Yugoslavs, on whom the defence of the northern Greek territory depended so much, was strictly non-committal and unsatisfactory. The Greeks, realizing fully the seriousness of the situation, were in no doubts that, if they allowed British fighting troops to enter their country, war with Germany was ultimately unavoidable. To their lasting credit, however, they preferred to accept such a situation rather than have to submit when the time came to a tame capitulation in face of overwhelming force. In consequence of this decision, a British force was rapidly assembled in Egypt and the first troops started to arrive in Greece on 7th March.

I do not propose to give a description of the dispositions or activities of this force, which presumably are included in detail in the G.O.C.'s report, except in so far as they affect the air operations in my command. The general role of this force was to support the Greek armies against a German threat from the north, and much discussion took place as to where this help could best be given. It was eventually decided that, owing to the shortage of time available before it was considered that Germany's preparations would be completed, and to the doubtful attitude of Yugoslavia, it would be unwise to

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move up to the Greek—Bulgarian frontier. Arrangements were therefore made for a defensive line to be prepared and occupied in suitable country west of Salonika, covering the Larissa plain.

Preparations for the Arrival of the B.E.F.

As time was all-important now, everything had to be subordinated to get this defensive position prepared and the force assembled. Engineering works on aerodromes which were not of immediate importance had to be stopped so that camps could be constructed, roads repaired, and all the preparations necessary to receive the force could be made. Similarly, in view of the necessity to avoid congestion at the docks, we were forced to use all our available transport to move the incoming munitions, stores, etc. On the arrival of G.H.Q., the army services which had hitherto been under my command, together with the appropriate army staff officers, were transferred to Army control. These commitments and rearrangements meant a certain amount of disorganization in my command. The weather, however, was now improving and the landing-grounds in the plains and valleys drying up. Therefore, no very great delays in our arrangements occurred.

Reorganization of R.A.F.

The arrival of the British expeditionary force and the establishment of a new front meant a further reorganization of my force and a readjustment of my slender resources. Although very few reinforcements had arrived as yet, and my pilots and air crews were beginning to feel the strain of heavy and continuous operations throughout the winter months, an additional burden was now thrust upon us. I still had to provide air support for the Greeks who were being ferociously attacked in Albania by the Italians spurred on by the presence of Mussolini himself. I had to provide air escorts for incoming convoys, also some form of air defence for the ports of disembarkation of British troops which were becoming alarmingly congested. I had to deliver occasional attacks on the Dodecanese Islands to reduce the scale of enemy attacks on convoys which were becoming embarrassingly frequent, and, finally, I had to allocate a portion of my force to support the position in process of occupation by British troops. I attach as Appendix "A"* to this report a memorandum which I issued on 18th March, pointing out the very parlous condition we were in at that time and describing how I proposed to attempt an almost impossible task. Apart from the fact that all my squadrons were much below strength in serviceable aircraft, due to the heavy casualties we had suffered and the unavoidable inability to keep us supplied with replacements, the re-equipping of my fighter squadrons with Hurricanes was not proceeding as rapidly as I had hoped. Furthermore, the arrival of reinforcing squadrons was not keeping pace with the programme decided upon, and those that did arrive were much below establishment in aircraft and equipment. In spite of these difficulties and disappointments, however, I still hoped that time would be on our side and that, when the German attack developed, we would be in a reasonable state of preparedness to meet it.

* Not reproduced.

The Battle of Cape Matapan

On 28th March a refreshing interlude to our troubles on land was afforded by the naval engagement off Cape Matapan. All our bombing squadrons took part and the Mediterranean fleet was able to bring the enemy to battle and inflict on them a smashing defeat.

The Fleet Air Arm

At this juncture it is appropriate to mention the good work carried out by the Fleet Air Arm operating from Western Greece. Six Swordfish aircraft of the Fleet Air Arm arrived in Greece on 11th March, and proceeded to Paramythia from where they operated against Valona and Durazzo harbours. Their task was beset by various difficulties. The high country surrounding Valona made a night approach awkward and hazardous, while it was almost impossible to get into the bay undetected. At Durazzo, the water was shallow and the approaches were thereby limited. Pilots reported the presence of night fighters over Valona. However, in spite of all this, several ships were sunk and many more hit and damaged during the period the Fleet Air Arm were with us.

Germany Declares War on Yugoslavia and Greece

In the meantime events were moving rapidly in the Balkans. While the Regent of Yugoslavia was signing away the freedom of his country, a coup d'etat was staged and we had a new ally. Large German forces had crossed the Danube and were moving into Bulgaria. Time was clearly running short. In spite of every effort, we were only able to arrange one so-called "staff conference" with the Yugoslavs, which did little beyond providing an opportunity for mutual criticism as to our state of unpreparedness for war, before the Germans declared war against both Greece and Yugoslavia on 6th April, and commenced invading both countries.

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The German Invasion

I propose to deal with the air campaign against the German air force in somewhat greater detail than the operations hitherto carried out in Albania. I do this because I believe there are valuable lessons to be learnt which, owing to the great disparity between the British and German air forces in this campaign, are shown up in high relief. In addition, our air force gave support to a British army which may, perhaps, consider that the major cause which forced it to withdraw from its positions and eventually evacuate Greece altogether, lay in the lack of this very air support. I was fully aware that the air forces at my disposal could not give the support which the army desired and which we would like to have given. Although I stressed the fact, the full consequences were perhaps not clearly recognized by the army. I feel, however, that if various aspects of our air inferiority are discussed, a more complete comprehension of the issues which are at stake may be gained, and that we may thereby pave the way to a better mutual understanding between the Services, a state of affairs which is essential for the efficient conduct of modern war.

Organization of R.A.F. Component

At the time when Germany commenced the invasion, my force was organized as follows:

A Western Wing—consisting of one bomber and one fighter squadron (Gladiator) supporting the Greeks in Albania.

An Eastern Wing—consisting of two bomber and one Hurricane fighter squadrons supporting the Anglo-Greek forces facing the German advance. The squadrons of this wing occupied landing-grounds on the Larissa plain which, although still soft after the winter rains, was now drying rapidly.

In the Athens area I had one bomber squadron and one fighter squadron in process of rearming with Hurricanes. Expressed in terms of aircraft, my total serviceable strength in the country was some eighty aircraft, to which were opposed, according to all reports, approximately 800 German aircraft on the Eastern front (Bulgaria and Roumania) and 160 Italian aircraft based in Albania plus 150 based in Italy but operating over Albania and Greece, mainly from advanced landing-grounds in Albania.

Disposition of Squadrons in Eastern Wing

The first problem with which I was faced in forming the Eastern Wing was that of disposing the air forces I could make available. My intention was to provide each squadron with a base aerodrome, and at least one and, if possible, two satellite landing-grounds.

The location of the fighter squadron was influenced by its role. This was threefold:

(*a*) To protect the base area, which included the army L. of C., the port of Volos and our aerodromes in the Larissa plain.
(*b*) To provide fighter escort to our bombers.
(*c*) To deal with enemy fighter aircraft in the battle area.

Larissa aerodrome was the most suitable from the geographical and communications point of view, and was one of the few aerodromes which was serviceable for all but a comparatively short period during the winter. Accordingly, the fighter squadron was based there with a satellite on a piece of suitable ground seven miles to the west. At Larissa the camp was well dispersed at the opposite end of the aerodrome to the hangars, which would be likely to attract bombing attack. Aircraft pens of sandbags capable of taking Hurricanes, though open at the top, were constructed in dispersed positions.

As regards the two bomber squadrons, it was my original intention to station them at Almyros, where I hoped they would be sufficiently far back to be immune from escorted bomber raids and low-flying fighter attack. Unfortunately, the Greek Air Force were already in occupation of this ground and I did not consider it safe for reasons of congestion to station more than one squadron there. The other squadron had to be sited temporarily at Larissa, pending the discovery of a more suitable ground. This was found eventually at Niamata, which in spite of a nearby marsh and consequent malarial infection, and in spite of the poor strategical position it occupied in the event of the withdrawal of an army to the Olympus line, was the only other which possessed a satisfactory surface and was suitable for night flying in the whole area north of Attica.

Thus the Blenheim squadrons were located at Almyros and Niamata. At each aerodrome every endeavour was made to gain the maximum dispersion of aircraft and encampments. Except at Larissa, the limits of the squadron camps lay at least a kilometre from the aerodrome. Aircraft were widely dispersed off the aerodrome at Almyros, but at Niamata this was hindered by a dyke and drainage ditch which protected the aerodrome from the marsh and lake beyond.

The one army co-operation squadron which arrived as the German attack developed I stationed at Kazaklar, where it was suitably sited for meeting the army needs. Unfortunately, however, this squadron rarely had more than one Hurricane serviceable at a time and, since the

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remainder of its aircraft were Lysanders, which it was quite impossible to use in the face of enemy air opposition, the squadron did very little useful work.

It should be realized that the German invasion of Greece started at a time when very few landing grounds were fit for use on account of rain. They were just beginning to dry, and had the attack been delayed for even a week we would at least have had several more satellite landing-grounds at our disposal. As it was, the change in the weather favoured the Germans.

Position of Eastern Wing H.Q.

Considerations influencing the location of the Eastern Wing Headquarters were:

(*a*) Ability of the wing commander to make quick personal contact with force commander.
(*b*) Reliability of communications.
(*c*) Ease of access to operational squadrons under wing control.
(*d*) Reasonable propinquity to aerodrome.

The overriding consideration in locating Wing Headquarters supporting the army on this front was that it should be close enough to Force H.Q. to allow the wing commander and the force commander to be within easy personal touch. It was considered undesirable, however, to locate the H.Q. beside Force H.Q., since the combined encampment would be of excessive proportions, difficult to conceal from the air, marked by deeply worn tracks, congested with vehicles and unwieldy to move.

The fully established wing headquarters failed to arrive in Greece by the outbreak of the campaign and, therefore, after consultation with the force commander, I decided to locate the skeleton wing headquarters beside Force H.Q. at Elason. The wing commander lived in the force commander's mess and so the closest liaison was formed.

Control of Squadrons

At the end of March the Army Signals detachment attached to wing headquarters was asked to link up all the aerodromes which were eventually used with direct lines to wing headquarters at Elason. This task was far beyond the scope and resources of the Army Signals detachment, with the inevitable result that land line communications were extremely poor. The factors leading to this state of affairs were as follows. The shortage of Royal Signals personnel resulting from the rapid R.A.F. build-up in Eastern Greece, had stretched to the limit the resources of the Signals Company despatched to Greece in July, 1940. Furthermore, priority for such equipment as was available was given to the forces in Libya, and the situation in Greece was acute, particularly as regards landline cable and wire. Technical limitations were a further cause. The trunk landline system was limited to overhead alignments which were frequently out of action as a result of hostile air activity, and reliable maintenance was beyond the resources of the Greek Postal and Telegraph administration. Accordingly, the Army was faced with providing the R.A.F. with field cable systems which automatically precluded long-distance speech facilities. Thus, although the wing had a direct line to Larissa, twenty-five miles of it consisted of field telephone wire, and the utmost difficulty was experienced in using this line. The force line or Fullerphone to the main exchange was used whenever possible. Similarly, communication to Almyros was not possible from Elason. It was therefore decided to establish a system of relaying operation orders in code by telephone from the wing commander at Elason to Larissa, where they were further transmitted as appropriate either direct to the fighter squadron at Larissa or by telephone to the bomber squadrons at Niamata or Almyros. For this purpose, an officer was permanently standing by at Larissa to relay operation orders.

Communication from Larissa to Niamata only twelve miles away was reliable, but to Almyros it was most unsatisfactory, largely due to the fact that the Air Defence Centre used the Almyros line for reporting enemy aircraft. As the campaign proceeded, so the demands both of the wing and of the Air Defence Centre augmented until finally it took as much as five to six hours to pass a priority telephone message from Larissa to Almyros. Thus it was decided to use the squadron at Niamata for any fleeting targets which presented themselves, while the squadron at Almyros carried out direct support operations, the need for which could be foreseen some hours previously.

Organization of Fighter Defence

The Greek observer system, consisting of posts with sub-posts radiating from each and linked to air defence centres by telephone, operated with a certain degree of success, and various interceptions of Italian aircraft had been made over the Larissa area.

A fighter operations room was established at Larissa and was run by the squadron stationed there. Depending on alternative duties, aircraft were standing by throughout the hours of daylight. It was, however, inevitable to leave the L. of C. and base area unprotected when the fighters were required for escort duty or protective duties over the forward troops.

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The system worked well, although there was little enemy air activity during the first few days of the campaign. When, however, the withdrawal of our troops began, the personnel manning the posts of the observer system had to withdraw and consequently the system broke down.

Liaison with Force H.Q.

The wing commander visited the force commander in his office each morning as a routine, and daily discussions were held in the force commander's mess both with him and his B.G.S. The force commander was fully informed of the air situation and made no excessive demands upon our resources. Without exception, the utmost was done to meet the requirements of the army and every request for reconnaissance made by the force commander or the B.G.S. was followed by a faithful endeavour to carry out that task. At the outset, however, weather was a serious hindrance, and in spite of the most frequent and determined efforts, many failures had to be reported.

The choice of targets for the bombers, the ways and means of providing fighter patrols over our forward troops, the question of leaving the base area unprotected whilst fighters escorted bombers or patrolled over the line, ground strafing of M.T., reconnaissance, and every other aspect of the air situation were discussed, and complete agreement was expressed with the direction and operations of the squadrons supporting the army. Neither the force commander nor the B.G.S. permitted themselves to indicate more than a general plan, in view of the rapidly changing situation, and they always expressed their agreement in the suggested methods of meeting any particular circumstances.

In addition to the personal liaison between the force and wing commanders, an A.L.O. kept in constant touch with the G. Staff, watching and reporting every development in the situation. It is difficult to know how air forces could be operated in closer co-operation with the military forces than was in fact the case during the opening days of the Balkan campaign. Whatever shortcomings there may have been in the support given by the air forces, they certainly cannot be attributed to lack of co-operation or to lack of the most faithful endeavours of our pilots. At every available opportunity, aircraft of this wing were doing their utmost to carry out the multifarious tasks which were required of them.

6th-9th April—The German Advance

On the morning of 6th April the German forces were on the march. The bulk of the enemy moved west from the Struma valley, filtering by all available roads into each valley and gorge, inundating every plain with their swiftly moving forces. The first air reports indicated that an attack was being made upon Mt. Beles and the Rupel Pass. Simultaneously, our reconnaissance aircraft reported movement of M.T. on the road west from Petrich.

It was certain that this movement would be covered by fighter patrols, and the fighters were sent off to carry out a sweep over the road and over the Greeks on Mt. Beles and in the Rupel Pass. Twelve Hurricanes met twenty Me. 109s. and our fighters shot down five without any loss to themselves. This disposed of any anxiety or over-cautiousness which the squadron commander of the fighters had felt about the change over from Italians to Germans. Whereas, at the outset, the squadron commander expressed the view that his aircraft could not operate in formations of less than twelve, he now agreed that formations of six would be able to escort Blenheim formations across the line. This meant that the base area only had to be left completely unprotected when the Hurricanes went off in strength to patrol over our forward troops. In the circumstances, the wing commander considered it a reasonable division of fighter strength.

Meanwhile, reconnaissances of the Struma valley were being carried out. During the course of that night Sofia, Gorna Djumaya, Simitli and Petrich were bombed by Wellington and Blenheim aircraft both from Athens and from the Larissa plain. These raids were most successful and pilots on their return reported good results. The weather was bad on the following day and no reconnaissance was possible, but it was anticipated that considerable concentrations of enemy M.T. would be found at Strumitsa. Late in the afternoon, in spite of severe weather, some of our aircraft got through and bombed the rich target presented by the heavy congestion of German M.T. confined to the road in this area by marshes and watercourses and the surrounding mountainous country. The escort of Hurricanes destroyed a Dornier. A large proportion of the German forces moving west against the Yugoslav armies had to pass through Strumitsa, as well as all the forces advancing on Salonika and those about to deploy themselves before our positions in the Mt. Olympus region. Consequently, as many heavy attacks as possible were made against targets in this area.

On the following day, the bad weather continued, but in spite of it we were able to get some of our reconnaissance machines through, and again in the evening we bombed enemy M.T. in considerable concentration near Strumitsa.

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Since the army co-operation squadron was short of aircraft, and since it was considered expedient to avoid sending unescorted Blenheims on long reconnaissances, the fighter squadron was asked to help out with reconnaissance. This squadron was thereafter frequently asked to provide reconnaissance aircraft, and although the pilots had had no reconnaissance training, they carried out the most valuable work throughout this period of great stress.

The wing commander had received an appeal to give bombing support to the Greeks who were cut off in the Salonika area. On consulting the force commander as to the relative danger to the army of the various points which the German advance was threatening, the wing commander decided, in view of the limited opportunities for air operations offered by the weather, and in view of his limited air resources, not to dissipate any effort on a front which was already lost in spite of the gallant action still being fought in the Rupel area by the Greeks. Nevertheless, the powerful bombing attacks against Strumitsa were bound to have a direct effect upon the situation in the area of Kilkis and Salonika, since German columns passing through Strumitsa and south to Lake Doiran were attempting to encircle the Mt. Beles position.

On the following day the weather was again very bad. From the information available, however, it was now clear that very considerable German forces were passing through Strumitsa. Some advancing south by Lake Doiran were already in or around Salonika, whilst the greater part continued west and north-west and were threatening the Monastir Gap.

The situation was beginning to unfold, contact was expected shortly on the Olympus line, but anxiety was felt on account of the ineffectiveness of the Yugoslav resistance and the lack of information as to the situation in the north. Every effort was made by our air force to alleviate the pressure on the Yugoslav army in order to give them time to withdraw in front of the highly mobile German forces, and to take up strong positions in the mountains and gorges.

9th-15th April—First Withdrawal

Communications between Force H.Q. and Wing H.Q. to Athens were now becoming extremely poor, and I was virtually out of touch not only with the wing commander but with the G.O.C., with whom it was essential for me to be in constant communication. Accordingly, I sent an officer of air rank to take over operations in the forward area. The air officer took over at a time when, in view of the intention of the army to withdraw to the Olympus line, plans were being drawn up to withdraw the ground party of the squadron of Blenheims at Niamata and to use it only as an advanced landing-ground.

During the next few days, until the complete evacuation of the Larissa plain on the 15th, enemy M.T. columns and concentrations on the roads between Prilep and Bitolj and in the Amyntaion area were bombed successfully by our aircraft. Our army had had little time to prepare strong positions in this area, which they had hoped would be protected for some time by the resistance of the Yugoslavs. A heavy burden was therefore thrown upon our air forces, which now virtually had to make up for the time lost by the caving-in of the Yugoslav forces. No stone was left unturned to delay the enemy and to shield our ground forces. Meanwhile, our army was engaged in fighting a rearguard action in the areas around Amyntaion and Kleisoura.

No sooner was the withdrawal to the Aliakmon line complete when, on account of the threat to its left flank, it became necessary for the army to make a further withdrawal to the Thermopylae line. Consequently, all R.A.F. units on the Larissa plain had to be withdrawn at once with the utmost speed along roads which were already congested. At the same time, the R.A.F. continued to throw all its power into delaying tactics.

On 14th April the weather improved and German air activity intensified. The Germans had brought their fighters forward to the Prilep and Monastir areas, where their engineers had prepared the necessary landing-strips. The German air force was mainly directed in close support of their army, and heavy dive-bombing attacks were made against our troops. Our Hurricanes, escorting our bombers in attacking enemy M.T. on the roads near Ptolemais and disorganizing his lines of communication, shot down many enemy aircraft.

On 15th April, the main effort of the German Air Force was directed against our air force, which had been delaying their military operations and had taken toll of their aircraft. Large numbers of short-range fighters made their appearance over the Larissa plain and groundstrafed Niamata. In spite of A.A. every aircraft of the Blenheim squadron located there was destroyed. Owing to the breakdown of the Greek observer system our fighters were at a hopeless disadvantage. When, on one occasion, Me. 109s appeared over their aerodrome at Larissa without any warning, three Hurricanes were attacked whilst taking off and two were shot down. The third shot down one Me. 109. Although, when our fighters were able to get off, they played havoc with the enemy, the situation was

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obviously untenable. I was present on the Larissa aerodrome whilst this attack was in progress and I ordered the squadrons to withdraw to the Athens area forthwith.

The Albanian Front

Meanwhile, the wide manœuvre of the German forces advancing swiftly through the mountain passes north-west and west of Skoplje was developing. Their intention was to force contact with the helpless Italian forces near Kukes in northern Albania and to threaten the right flank of the Greek armies in Albania from the Lake Ochrida area. The Greeks, who had fought so valiantly against the Italians throughout the winter months, were hardly in a position to withstand the extra pressure of the German forces. Withdrawal from Albania in the Koritsa area had been considered expedient by British commanders before the German invasion began. However, the Greeks did not take a sufficiently strategic view of warfare to allow such a withdrawal to be carried out without seriously affecting the morale of the army. This was especially the case when wrested from the despised Italian invaders. To give up their acquisition of their own free will and to see it fall once more into the hands of the Italians was for the Greek fighting soldier in the line an intolerable idea. When in fact, the withdrawal was eventually forcd upon them, it was too late for the Greeks, reliant upon mule and bullock-cart transport, to conduct an orderly retreat. Morale and organization collapsed. The Greek army commander at Yannina capitulated to the Germans.

As the situation in this area deteriorated, it became increasingly obvious that it was necessary to withdraw the R.A.F. Western Wing, consisting of one Blenheim and one Gladiator squadron. This was successfully carried out in spite of difficulties which arose as the result of numbers of Yugoslav aircraft and personnel arriving at Paramythia aerodrome and requiring fuel and food right up to the last moment.

15th-24th April. Second Withdrawal.

At this juncture I decided to abolish the Eastern Wing and take over control of all operations from Athens. I left an R.A.F. officer at Force H.Q. to act as liaison between the army commander in the field and myself. Later, when Force handed over the direction of the withdrawal to Anzac Corps, this officer was attached there. The army commander desired only reconnaissance and fighter protection which we did all we could to provide.

Throughout the withdrawal the army co-operation squadron carried out what reconnaissance they could. After they had evacuated Kazaklar, north of Larissa, they operated their few aircraft from Pharsala, which by this time was serviceable. Later they operated from Amphiklia, just behind the Thermopylae line. Here there was a Greek Gladiator squadron which was ground strafed and destroyed as soon as the Germans were able to locate their fighters on the aerodromes on the Larissa plain. The army co-operation squadron's Hurricanes were not on the aerodrome at the time of the ground strafing, and so luckily escaped, but I considered it wiser to bring them back to the Athens area.

In view of the complete numerical superiority enjoyed by the enemy, I decided to operate my Blenheim squadrons by night as much as possible in efforts to delay, as far as lay in our power, the enemy's advance. But after the decision to evacuate had been taken, the whole weight of the German Air Force was turned on the Athens area and there was no alternative but to save what air crews and material remained. These squadrons ferried the remainder of the personnel of their squadrons to Crete and carried out their instructions with discipline and courage in face of great peril.

Direction of Bombing Effort

As far as the direction of bombing is concerned, the operations against the Germans followed four clearly defined phases:

The first phase, lasting for about two days, was the disclosure of the enemy plan prior to gaining contact with our troops. During this phase, bombing was directed at previously arranged targets in the Struma valley, including Petrich, Simitli, Gorna Djumaya and Sofia.

During the second phase, in which the direction of the German advance was recognized and in which every possible effort was made to alleviate pressure thrown against the Yugoslav armies in the west and the Greek armies in the Salonika area, bombing was directed against supply columns and concentrations of enemy M.T. at the bottleneck around Strumitsa, where the German forces divided into two columns.

The third phase, in which a serious threat developed against the British armies in the region of the Monastir gap, was devoted to the bombing of bottlenecks, railway junctions, stations, bridges, defiles and concentrations of enemy M.T. on roads leading towards the Monastir Gap, from Skoplje, Veles, Prilep to Bitolj.

The fourth phase was the direction of all our air effort in hindering and delaying the advanc-

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ing Germans to allow our army to conduct a successful withdrawal. All our resources were thrown into the task of alleviating the pressure on our forces in order to allow them the maximum amount of time to withdraw and to prepare new positions.

Targets were chosen at points where it was calculated that the effect of dislocation would be most widespread amongst advancing German columns, and yet close enough to the rear of the German fighting troops to have the maximum immediate effect upon the progress of their advance.

It is impossible to calculate the degree of success which this policy attained, but German prisoners who fell into our hands told woeful tales of the heavy bombing which they had suffered from the R.A.F. throughout their advance. On the night 14th/15th, our Wellingtons created much chaos at Veles and broke the bridge across the Vardar. A glance at the map will at once show the importance of a dislocation in the German L. of C. at this point. It is the hinge upon which one, perhaps the greatest, of the main German drives depended.

The continual bombing of M.T. which presented some of the best targets which our Blenheim pilots, accustomed to such targets as dispersed vehicles in the desert, had ever known, caused much confusion amongst the enemy.

Withdrawal of Fighter Squadrons

The fighters were withdrawn to the Athens area, since no aerodrome north of this was free from ground strafing. The constant lack of intermediary aerodromes made it inevitable that, if our fighters were placed on an aerodrome from which they could give protection to our troops, they were in imminent danger of destruction by ground strafing as soon as they were on the ground. If, on the other hand, they were placed beyond the range of ground strafing, they were unable to protect our troops and the tightly packed columns of M.T. withdrawing along the roads. The utmost efforts were made to give the maximum protection to our continually harassed troops. All our machines were working to maximum capacity. Many of our pilots were working at extreme range, challenging untold odds and at times, after they had used up their ammunition, pursuing enemy aircraft engaged in ground strafing our troops.

On 20th April, approximately 100 dive-bombers and fighters attacked the Athens area; my whole force of fighters of fifteen Hurricanes intercepted them, bringing down a total of twenty-two enemy aircraft confirmed and eight unconfirmed for a loss of five Hurricanes. Small as our losses were, they were crippling to our small force.

Even after having been shot down, our fighter pilots would immediately take the air in aircraft which had been riddled with bullets and by all normal standards were totally unserviceable. The courage of these men never failed nor looked like failing. Each day their fellows died, each day they stepped into their battered aircraft, not without a sensation of fear but quite undismayed. Each man was aware of his great responsibility in face of great odds.

Final Evacuation of Air Forces

On 22nd April I sent the remaining Hurricanes to Argos. From here I intended that they should cover the evacuation of the British Army, but the German air attack became so concentrated that after a number of Hurricanes had been destroyed on the ground on 23rd April, the remainder were ordered to leave for Crete. In Crete, Blenheim fighter patrols were organized to cover the ships evacuating the troops from the beaches. These escorts were maintained throughout the evacuation without respite, and I consider it was due largely to their efforts that such a large proportion of the total British forces in Greece were evacuated.

A reference to the evacuation would not be complete without a tribute being paid to the flying boats, both of the R.A.F. and the B.O.A.C. These boats carried out magnificent work ferrying parties of airmen and soldiers both from the mainland to Crete and from Crete to Egypt. A number of their flights were carried out in conditions of the utmost danger and, throughout, the pilots and crews displayed the utmost gallantry and devotion to duty. From the point of view of interest, the record number of personnel carried in one single Sunderland on one trip was eighty-four.

Conclusion

The lessons and conclusions to be drawn from a campaign of this description are many, and in Appendix "B"* to this report I have included those which I consider are of the chief interest. In bringing out the various points that come to my mind, I find it difficult to avoid criticizing various aspects of service organization and doctrines. I would like to point out, however, that these criticisms are made in an entirely constructive sense and in the hope that profit may be gained by our experience.

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Where we are in possession of totally inadequate air forces, there will always be requests from every direction for the air support which in ideal circumstances we would comfortably be able to provide, and which indeed we would be only too pleased to give. In Greece we had the minimum, and in order to produce any results at all it was essential that all available force was directed in accordance with a carefully conceived plan. As our bombing forces were inadequate to deal decisive and instantaneous blows on the enemy, our policy had to be to sustain our small efforts for as long as possible at points where the resultant dislocation caused the enemy the utmost embarrassment. This we were able to do in Albania, for the Italian air strategy was extremely weak, and the numerical odds were only some four or five to one against us. When, however, we had to face the full force of the German onslaught in addition, the odds became too great in spite of the superb gallantry of our pilots and crews.

In spite of the strategic and tactical disadvantages under which our air forces laboured in Greece, in spite of the great enemy superiority in numbers, and in spite of the weather conditions which there can be no doubt were the worst in which British air forces have had to operate throughout the world, a considerable offensive effort was developed. During the Albanian and German campaigns in Greece our fighters destroyed 232 enemy aircraft confirmed, and a further 112 unconfirmed. Our bombers operating by day and night dropped 550 tons of bombs on the enemy. There was no indiscriminate or area bombing. Each bomb was carefully aimed in order to obtain the maximum effect to ensure that the efforts required to overcome the disadvantages which beset our air crews were not in vain.

The participation of our land forces in the Greek campaign was dictated entirely by political considerations, and we were fully aware of our weaknesses both in the air and on the ground. I have heard criticisms made that, under these conditions, we should never have sent a land force to Greece. I attended all the conferences held in Greece to discuss this matter, and I would like to say without any hesitation, and in the light of subsequent events, that in my opinion the decision made was a right one and in accordance with the best traditions of our race. There was always the chance that, in the first place, Germany would respect the neutrality of Yugoslavia and that her advancing armies might be delayed sufficiently long to enable our forces to be strengthened and our position made secure. On the other hand, if Yugoslavia threw in her lot with us, which eventually she did, it was reasonable to suppose that her soldiers, renowned for their fighting qualities, would prove a tough nut for the Germans to crack and they would be able to protect our left flank. In any case, we would be containing large enemy land forces and air forces at a time when Britain needed a breathing space to perfect her defensive arrangements.

Furthermore, the assistance which we were considering was to be given to a nation which had sacrificed her all in our cause and was herself quite prepared to face complete extinction rather than capitulate. I suggest that it would have been difficult to refuse her this help and our conduct would have been most reprehensible in the eyes of our countrymen and those of important neutrals had we failed to do so.

Finally, I would like to express on behalf of each individual under my command, my sincere appreciation of the generous hospitality and friendship which were unfailingly shown to us by Greeks in every walk of life. We will never forget the brave and courteous spirit of these people, whose kindness and sympathy towards us were as great when we finally had to leave Greece to the occupation of the Germans as when we arrived in November last in the fever and anxiety of the opening days of the war against Italy. It was with a feeling of deep regret but of profound admiration and affection for this heroic people that we left the shores of Greece.

Under separate cover I have forwarded to you the names of officers and airmen who I would particularly like to bring to your notice for their excellent work and devotion to duty during this campaign. I have nothing but praise for all the officers and airmen whom I had the honour to command, whose conduct was at all times exemplary and who, even during periods of the greatest stress, continued to work with that cool and calm efficiency which we have become accustomed to expect from the members of the Service.

I have the honour to be, sir,

Your obedient servant,

J. H. D'ALBIAC,
Air Vice-Marshal,
Commanding R.A.F. in Greece,
November, 1940, *to April,* 1941.

(See also despatch by A.O.C.-in-C. Middle East published in Vol. 18, No. 1, pages 32-39.)

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H.M. King George of Greece presides at a Conference in Athens. Left to Right: Major-General Gambier Parry, General Metaxas, the King of Greece, Air Commodore D'Albiac (whose war despatch is published in this issue of "The R.A.F. Quarterly") and General Papagos

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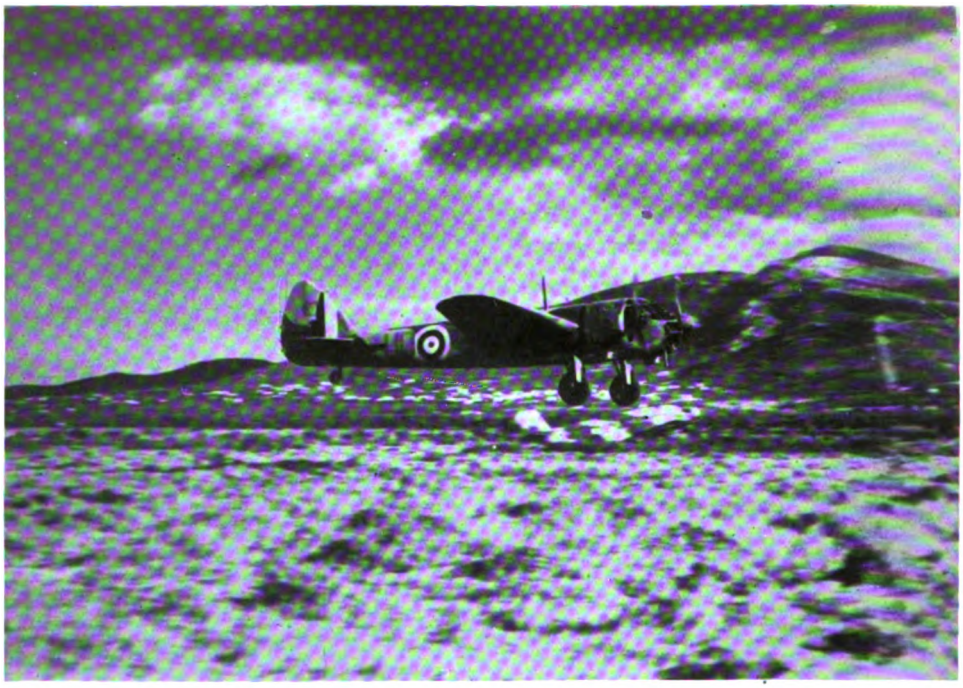

R.A.F. Bombers in Greece. This photo illustrates the difficult landing terrain with which our Air Force had to contend in the campaign in Greece

A Blenheim bomber returns from a raid over Albania. These aircraft did remarkably good work under the most difficult operational conditions and in face of vastly superior —numerically—German and Italian Air Forces

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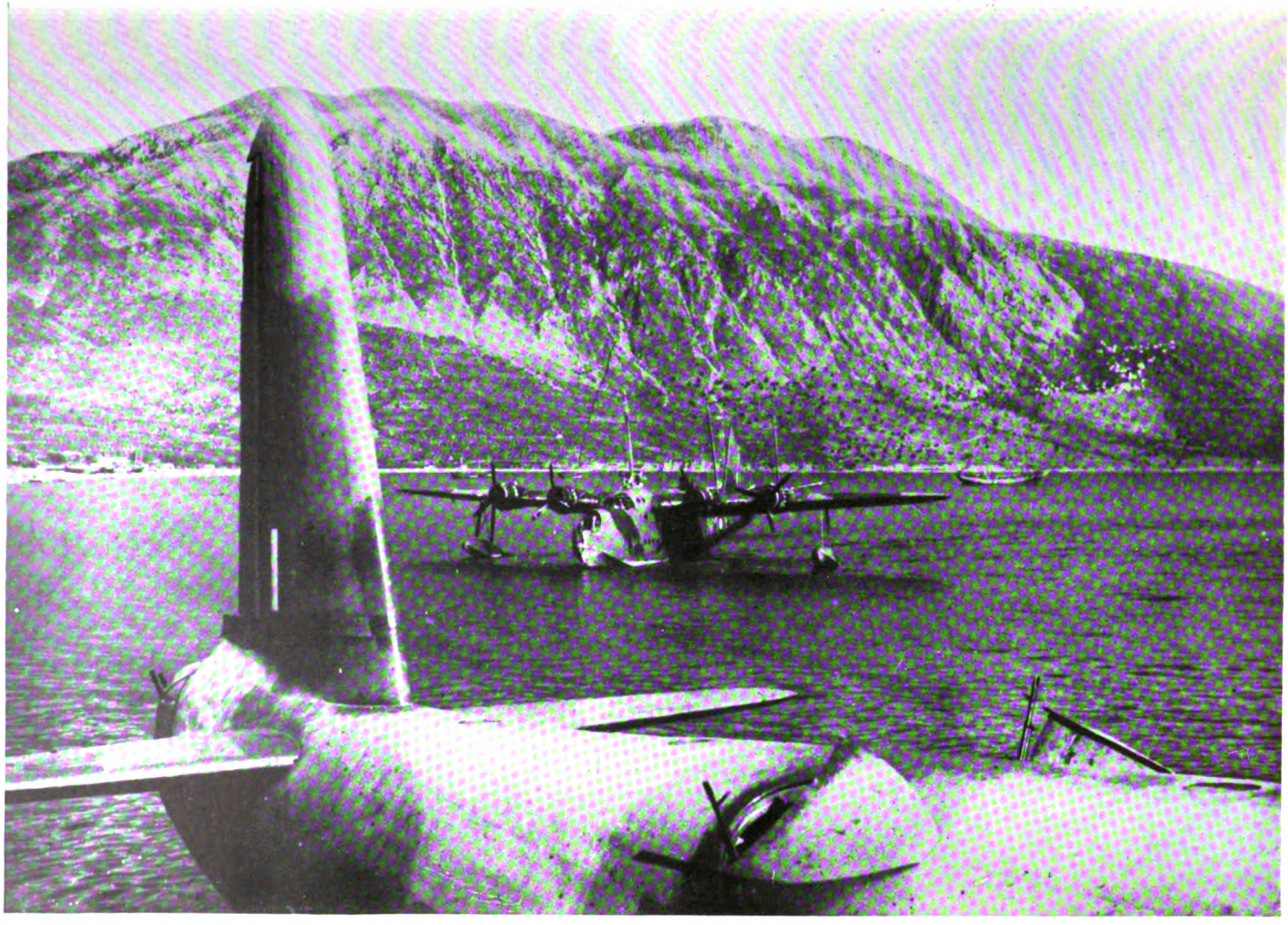

Sunderland flying boats played a prominent part in the British withdrawal from Greece and Crete

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Reorganization of the R.A.A.F. for Peace

THE Japanese surrender, whilst relieving the Allies of the multiple activities of active warfare, left its aftermath of major problems. The R.A.A.F. was faced with the same difficulties of returning to a peace-time organization as were all other British Empire Armed Services.

The transition from war to peace demanded the maximum of effort from all who volunteered to remain in the Royal Australian Air Force. With a staff depleted and gapped by a rapid demobilization, such problems as the provision of a R.A.A.F. Contingent with the Occupation Forces of Japan, the planning of a peace-time organization, the disposal of surplus equipment and aircraft, and the storage and maintenance of equipment and aircraft for future use provided a task of no small magnitude.

The reorganization of the R.A.A.F. for peace shaped itself into two main phases. The first phase was the transition or interim period; planned to be completed in two years, this phase was to see the completion of the tasks created by the cessation of hostilities. Further, by the preservation of developed techniques, continued technical investigation and the maintenance of a basic training organization, it was to lay a firm foundation for the second phase—the establishment of the peace-time Royal Australian Air Force. During the second phase it is hoped to develop an Air Force to meet the defence requirements of Australia and able to contribute the maximum effort to Empire defence. The peace-time R.A.A.F. will be so constructed as to enable rapid expansion in the event of war.

Demobilization

After the recovery of prisoners-of-war and internees, demobilization was given the highest priority. All except volunteers for deferred demobilization were to be discharged within twelve months. This aim was achieved, and today the overall rate of discharge has been reduced from the maximum of 5,500 per week in December, 1945, to approximately 150 per week. The strength of the R.A.A.F. on 1st October, 1945, was 152,000; today it is approximately 11,000, 7 per cent. of its war-time strength. This reduction in personnel strength far outstripped the reduction in work to be done. Large quantities of equipment and aircraft had still to be inspected and classified for disposal, giving rise to problems of maintenance which were aggravated by the loss of personnel. All except essential units were disbanded. Where equipment had still to be disposed of, Care and Maintenance Units consisting of a minimum of personnel were formed, and these units were given the responsibility of caring for and maintaining all equipment at that location. Mobile parties of approximately forty skilled technical equipment and accounting personnel available were then formed. These parties moved within a definite area of responsibility to examine, sort and prepare for disposal (either for storage for peace-time use or for sale) all equipment at Care and Maintenance Units.

Rehabilitation

Resulting from experience gained following World War I, rehabilitation planning was commenced in 1940. In January, 1941, the Australian Government established a Reconstruction Division of the Department of Labour and National Service, which was to act as the co-ordinating agency for all problems of post-war reconstruction with particular regard to the re-establishment in civil life of men and women enlisted in the Services or engaged in war industry. Later, this responsibility was given to a separate ministry, the Ministry of Post-War Reconstruction.

The plan for rehabilitation of Service personnel was based on the principles that—

(*a*) The Service was responsible for:

(i) Information and advice up to point of discharge.

(ii) Handing the member over to the civil department with a well-informed idea of his intentions and with a statement of those intentions and of his qualifications.

(*b*) The civil departments were responsible for rehabilitation action in their particular fields.

R.A.A.F. Rehabilitation Sections were staffed, trained and organized to give the best advice over the whole re-establishment field to personnel being discharged.

The Australian Government established a Commonwealth Employment Service to operate throughout Australia. Legislation was introduced to extend Service preference to the 1939-45 war.

In co-operation with the State Governments, the Ministry of Post-War Reconstruction is now meeting the principal needs of the discharged personnel. A War Service Land Settlement Scheme is in operation and every step to ensure success is being taken. The number of people to be settled will be determined by settlement opportunities rather than by the number of applicants. Only the best available land and the

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most suitable people will be considered for the scheme.

Full-time training for a profession, a trade, or for rural work is being given to specific classes of Service personnel discharged after six months' continuous service, and a living allowance and funds for books, tools, and other essential equipment is being paid. Special living-away-from-home allowances will also be paid if the trainee is required to live, for the purpose of training, in a town or State other than that which is his normal residence.

Part-time training in classes or by correspondence is also available through Universities and Government Institutions; this is supplemented by approved private training in educational institutions and establishments where necessary. Tuition fees and expenses such as books, incidental tuition of a member in part-time educational or professional training, and part-time study of a cultural or general educational nature may be paid up to a limit of £60. (Further details have been published in A.M.O. A.6/47.)

Recruiting

To overcome shortages in R.A.A.F. trade groups and musterings (especially technical and domestic) recruiting was recommenced towards the end of 1946. Active campaigning is producing very satisfactory results and the recruits will provide the requirements of the Interim Air Force and will form a firm foundation for the peace-time organization.

As yet, full details of post-war conditions of service have not been determined. Recruits are being offered engagements for a two-year period under war-time conditions of service, but efforts are being made to finalize peace-time plans as early as possible. Much has been learnt from R.A.F. intentions in this regard.

A new pay code and recommendations for new standards of quarters have already been submitted for approval by the Australian Government. Any improvement in the conditions of service will materially assist recruiting, particularly in the type of personnel offering, and it is hoped that the new conditions will soon be announced.

Training

During the war the R.A.A.F. trained large numbers of flying personnel, not only for its own forces based in Australia, but to implement their part of the British Commonwealth Air Training Scheme Agreement. On the cessation of hostilities, all training establishments which were not required to supply wastage replacements for the peace-time R.A.A.F. were disbanded. Those to be retained were reduced to the minimum necessary to preserve training techniques and equipment.

With the enlistment of new recruits towards the end of 1946, ground training was revitalized. The first steps were refreshing ex-airmen personnel; later, this was enlarged to cover basic training of civilian recruits who had had no previous service.

During the period between the conclusion of the 1914-18 war and the commencement of the 1939-45 war, most airmen personnel, including technical musterings, were recruited direct from civil life. Recent experience indicates the necessity for basic Air Force training of these personnel in the highly specialized tasks which they are required to undertake. The R.A.A.F. is thus taking steps to ensure specialist training of airmen at the highest peak of quality. Bearing in mind this requirement, the R.A.A.F. intends to introduce an apprenticeship scheme on the lines of that established in the Royal Air Force. This scheme will be linked where practicable to the trade training carried out at civilian technical institutions in Australia. It is intended that that system will provide educational and technical training for youths aged 15 to 16 years as apprentices over a three-year period. At the conclusion of their course, these apprentices will spend one further year on Air Force units before being passed out as qualified technicians.

Further, a Cadet College is being planned at present along the lines of the Royal Air Force College, Cranwell. The course will cover four years' specialized training. Youths of 16 to 18 years will be selected for this College.

Operational

During the interim period active flying has been resricted mainly to essentials, including the British Commonwealth Occupation Force in Japan, transport duties within Australia and to Japan, air/sea rescue, bush fire patrols, destruction of insects by aerial spraying, and a photographic survey of Australia.

The most active part of the interim R.A.A.F. is its air component with the Occupation Force in Japan. This consists of a fighter wing, with its base squadron, maintenance squadron, mobile fighter control unit and three fighter squadrons, together with an airfield construction squadron. The air construction squadron is responsible for the construction and maintenance of strips and buildings for the air arm of B.C.O.F. in Japan.

These units are being kept at full strength and they will be maintained for as long as they are required in Japan. When their duty in Japan is completed, these units will be withdrawn to be dovetailed into the fighter organization in Australia.

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In the twelve months December, 1945, to December, 1946, the R.A.A.F. transport aircraft did sterling work. They maintained the long air route from South-Eastern Australia to Japan and transported a continuous stream of mail, medical supplies, urgent aircraft supplies and passengers. The transport squadrons were equipped with Dakotas and it speaks well for aircraft and crews that after over 2,000,000 miles' flying, carrying 940,000 lb. of passengers and freight and 296,000 lb. of mails to Japan, not one aircraft was lost. In addition, the same units maintained a continuous courier service from Perth, Western Australia, to Rabaul, New Britain.

Air/Sea Rescue.—The Air/Sea Rescue organization was also considerably reduced with the cessation of active hostilities, but an effective service was retained. Three Air/Sea Rescue Flights, dispersed to cover the main air routes, and a central base were maintained. These units employed Catalinas for air search and 48 ft. launches for sea rescue.

During the war all surface vessels were controlled by the R.A.N., and sea search and rescue were carried out by the Navy in co-operation with the R.A.A.F. This responsibility has now been taken over completely by the R.A.A.F., and the whole A.S.R. organization is now under the one control.

Bush-Fire Patrols.—An unusual, but most necessary duty of the R.A.A.F., is that of flying to observe and report the location of bush fires in the forests fringing on settled areas. This work is carried out in conjunction with the Australian Forests Commission and serves as a warning and a fire-fighting measure. In the past there have been numerous occasions in which bush fires have assumed tremendous proportions, sweeping down on small townships and main roads, burning homes and in many cases trapping the occupants or the passing motorist. The loss of life has been considerable.

When weather conditions are such that bush fires are likely, aircraft stand by in readiness or patrol over the particular danger areas as requested by the Forests Commission. The Commission maintains small outposts in the forest, equipped with radio sets for direct communication with the patrolling aircraft. This frequently enables action to be taken to extinguish fires before they become too large.

Experiments in the use of anti-fire bombs, which are being manufactured in Australia, are being carried out in co-operation with the Commission. Preliminary trials show promise, but flying difficulties in the mountainous country with tall timber are considerable.

War on Pests.—Another Australian problem which demands the employment of aircraft is that of controlling grasshopper and other insect plagues. Aircraft are fitted with spraying apparatus, and flying at low altitude, they spray the infected areas. Between 85 and 100 per cent. of grasshoppers in sprayed areas have been killed by spraying diesel oil containing 4 per cent. of Gammexane at a rate of four gallons per second. This commitment will be a recurring one and development of spraying techniques is being continually studied. The Victorian Department of Agriculture has stated that spraying carried out by the Air Force saved the Commonwealth £5,000,000 during the 1946 season.

Air Surveys.—The war interrupted the geodetic survey of the Australian mainland. Aerial photographic survey flying, which was carried out by the R.A.A.F. pre-war is now to be considerably developed. Experience gained from war-time P.R.U. work will be invaluable in this regard. Mobile Radar Stations are to be employed to give greater accuracy of track flying, and the R.A.A.F. is co-operating closely with the Army on the project as it is considered essential for the defence of the Commonwealth. The geological and forestry information obtainable from aerial photographs makes the effort of further value.

The first major peace-time task of the Survey Squadron is the aerial survey of 50,000 square miles of Queensland territory. This, in addition to fulfilling the mapping commitment, will be used to select sites for reservoirs, soldier settlements, and general development on behalf of the Queensland Government. Subsequent work will be carried out in an order of priority determined by the demands of regional planning and the development of Australian resources. Altogether approximately 1,600,000 square miles will be surveyed by aerial photography in the next five to six years. Australian-built P.R.U. Mosquito aircraft will be used.

Although during the interim period normal Air Force activities have continued on a reduced scale, it is intended that the end of 1947 will see the R.A.A.F. developing towards the establishment of a sound and efficient peace-time force. This will require a constant appreciation of the development of all new weapons and an intensive study of the possibilities that such weapons reveal in the employment of air forces. The maintenance of constant liaison with other parts of the Empire and the continual exchange of information and staff officers with the R.A.F. and other Dominion Air Forces are of the greatest importance in this regard and are the foundations upon which Empire Defence will be continued.

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Lessons I have learned from the War

By JAKE (Squadron Leader, R.A.F., Retired)

HAVING served in the Army during the 1914-18 War I was commissioned in 1940 as a Pilot Officer in the A. & S.D. Branch and was sent to a war-time station which had barely opened. On arrival I found the strength to be eight officers and fifty other ranks. Before I left some two and a half years later it had grown to 180 officers and 7,500 other ranks. This, I suggest, was most excellent experience, as I grew up with the station and learned the hard way all the teething troubles which can be encountered under such circumstances.

After a brief spell I became Assistant Station Adjutant and very soon took over the duties of Station Adjutant. My C.O. was of the Old School —a strict disciplinarian, but very fair. Unfortunately he did not attempt to get to know the officers and men personally, and was The Station Commander at all times and almost unapproachable. Pity that some officers won't learn that discipline is the *willing* obedience to orders. How much easier they would make it for themselves and for those serving under them. An all-round improvement of discipline would follow *naturally*. A good officer must be able to mix freely when off duty without loss of dignity or authority.

The Junior Officers' Administrative Course at Loughborough was soon my lot, but I did not learn much of value there as the chief object of the course appeared to be to learn, parrot fashion, the numbers of the paragraphs in King's Regulations and of Forms in use. Better, I suggest, to teach the young officer how to use these books and forms and not to have him learn laboriously that Para. 1138 deals with the Powers of a Subordinate Commander, and Para. so and so something else. Isn't it sufficient that he knows that there is such a paragraph, knows its purport and how and where to look it up when occasion demands?

The Senior Officers' Course at Stannington was excellent but had still too much stress laid on the memorizing of numbers rather than how to use the knowledge. While on the subject of courses, I wonder how much weight Air Ministry gives to the results? Very little, it would appear. A squadron leader fails his course, a flight lieutenant gets the highest possible marking on the same course (above average) but both retain rank and appointment as if no course had been attended.

A spell with a dispersed wing as a squadron commander broadened my knowledge and brought me in touch with "bodies" rather than "forms." I will be eternally grateful to my C.O. for enabling me to gain experience of office routine and outside work as well. What unlimited scope an officer has as a squadron commander if he forgets the existence of a clock! I got a great thrill and, incidentally, the M.B.E. for working fourteen to sixteen hours per day, and was repaid a thousandfold by the respect in which I was held by my N.C.Os. and men. Organizing of dances, concert parties, choirs, amateur dramatics and the general welfare of the men placed under my control kept me busy often well into the night. The most profitable work I did, however, was the holding of "grouse" meetings in huts and tents. In some respects these meetings will now be undertaken by the committees to be appointed on each station, but there is just the fear that they will be rather impersonal. My method was to visit at least one hut per week, address a few words to the men and then throw the meeting open for questions. How they loved it and how they bombarded me with queries and grumbles! Once aired, it usually transpired that the latter were very trifling affairs indeed, or I was able to give a reason for the cold tea at tiffin time, the failure of the electric light and so on. It was surprising the number of valuable suggestions that were forthcoming, suggestions which were of benefit to the station as a whole. I discovered very early in my career that if I took the men into my confidence and explained the whys and wherefores I had merely to express a wish to have it carried out *cheerfully*. Voluntary field exercises on Sundays run on a competitive basis as between squadrons brought an attendance of 80 per cent.—and how the men entered into the spirit of the thing and how quickly they learned!

In addition to these meetings I made myself available two evenings per week to give advice on Service or civilian problems which might be worrying my men. The average number of interviews per evening during five years was twenty and must have totalled some thousands altogether. I suggest the need for such "advice evenings." Further I made it clear to my staff that I was prepared to see any man at any time if he had an urgent problem. This privilege was never once taken advantage of and, I am glad to say, I was able frequently to turn a disgruntled *erk* into a first-class airman—proud of his squadron, proud of the R.A.F., and ready to render that willing obedience to his superior officers.

To digress a little. It would appear that the tremendous responsibility of a Station Adjutant

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is not sufficiently appreciated. A station can be made or marred by the Adjutant and he should, on a large station, be a squadron leader, not just the senior flight lieutenant. His duties are multifarious and he must know all the answers and be available day and night. His training is a long and arduous one and he should be awarded correspondingly when efficient.

If it is correct to have an officer with legal experience to prosecute at courts martial, surely it is only fair to the accused that the defending officer be equally knowledgeable. Alas, how often it happens that Flight-Lieutenant Stooge is detailed to defend—he doesn't know the procedure, has no interest in the case and the only sufferer is the accused.

When will it be realized that the best goods are cheapest in the long run? A typical example is electric light bulbs. They are frequently of poor quality and invariably low in power. Good bulbs would not only give longer life but more contented airmen, and they, in turn, would give better service. I believe a good 60-watt lamp requires very little more power than a 40-watt one of the cheap type and there is certainly no comparison in the results.

Let me say that no one holds the G.D. Branch in higher esteem than I do, but surely the time is ripe when promotion is not restricted to those who are the proud possessors of "Wings"? A known case is a station where the establishment (Administration) was wing commander, squadron leader, flight lieutenant and flying officer, but the snag lay in the fact that the wing commander's post was a G.D. vacancy. The result? In a period of little over fifteen months four ex-aircrew wing commanders were posted to the vacancy. Not one of them had previous experience of administration and none of them was interested in learning, so the burden fell on the other three officers. I am in full agreement with the policy of placing aircrew officers on completion of flying duties, but it should not be to the detriment of officers experienced in ground duties. For more than half that period the squadron leader filled the vacancy but he got neither rank nor pay for it. Would it not be fair that he be given the rank and pay of the post he fills while he fills it? I understand that is the custom in the Army. I was recommended personally by three Station Commanders for promotion but the answer was the same in each case—it's a G.D. vacancy. Would the fact of my having been a pilot in the R.F.C. have made me a more efficient administrative officer?

Officers must be on parade at all times, for the slightest deviation from the path of duty, the slightest slovenliness in dress will be used as an excuse by junior officers and by N.C.Os. and men in turn. The higher the rank of the officer the more he must discipline himself. He must be proud of his uniform and the commission with which he has been honoured. It is only by hard work and attention to duty that you will merit the confidence of your superiors and warrant promotion. *Per ardua ad astra.*

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MARCH, 1947, QUARTER

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"Hotel Billet"

By Section Officer H. L. Maitland, W.A.A.F.

The author of this article after seven years on R.A.F. stations describes with satire and humour how some of the more typical occupants of an average hotel in a busy city strike her.

Introduction

WHEN, after seven years of working on R.A.F. Stations and being accommodated in Mess, I found myself posted to a job in a busy city where of necessity I had to find myself a billet, to say the least of it I was somewhat dismayed. My good friends advised me that I would be well suited in a private house, and with this end in view I spent many weary hours tramping round, calling on innumerable prospective landladies, and finished up footsore and weary at a hotel. The good lady of the hotel recognized my uniform and informed me that she had a great regard for the R.A.F. and recalled what they had done for the country in the Battle of Britain and since then, and I, for the moment, basked in their reflected glory. When she quoted specially reasonable terms to me I decided to end my search and settle down in a hotel billet. I was already missing the companionship of the Mess, and felt strangely lonely even among so many people. Living among civilians after so many years, however, has proved much more interesting than I anticipated.

Part I—The Rabbit

Apart from the familiar signs indicating first-class cuisine, the hotel, situated as it is in a "nice residential district," has the appearance of a private residence. The front, with its elaborate stonework, is ornamented with a balcony which extends the length of the first floor. The ravages of war have taken toll and the grape vine which wound its way up the stone pillars has received a mortal wound. The damaged balcony is supported by a framework of modern steel tubing, while workmen daily endeavour to restore it to its pre-war grandeur.

A dozen steps lead to the front door, which opens into an outer lounge. Oil paintings by a long-forgotten artist endeavour to lend a Tudor effect. A Cavalier and a Roundhead from opposite corners of the room survey the scene with a look of cold indifference. A few residents sitting around either pretend to read or convey the impression that they are not really waiting for the dinner gong. The old clock ticking away on the mantelpiece seems a living thing in this room of silent humanity. As though to break the monotony, the old clock strikes " nine." With a knowing look someone remarks to the newest resident " That's seven-thirty." Soon everyone learns that at 8.30 the clock will strike ten, at 9.30 eleven, and so on. The ice is broken. Animated conversation ensues. The old clock ticks steadily on with a contented air.

The dining-room, which is entered from a narrow passage on the ground floor, is almost regal in its old-world splendour. The clusters of crystal lights suspended from the roof are slightly less bright than their designer intended—present-day economy has demanded the extraction of half the requisite bulbs. In the dim light, the dark mahogany tables reflect the shining glasses and cutlery. The gong has sounded and, like the native in response to the tom-tom, they come from all parts of the house. Old and young, tall and short; some slip in quietly as though afraid of being seen, others enter like gladiators into the arena; the less agile slowly wind their way between the tables; the oldest resident takes up the rear.

In spite of her eighty-four years, she walks smartly to her table by the window. Her white hair is cut very short and sticks out like a tooth-brush above her collar. Her shoulders are badly rounded, forcing her head forward. Her appearance, as she winds her way to her table clutching a variety of articles in her arms, reminds one of a toy rabbit clutching a carrot. She sits down and proceeds to arrange " the articles." A bottle of sauce is placed in the centre; a jar of sugar on the left; on her lap a table napkin; and in front, above the sweet fork and spoon, two candlesticks! Some of the diners turn slowly in the direction of the Rabbit, the better to follow the ceremony. Of the others who ignore the proceedings, it can only be assumed that they are "regulars" and have been initiated into the mystery of the candles. From the pocket of her blouse, a smock-like affair, she produces a box of matches. She strikes a match and slowly lights each candle. Her hand goes forward to reposition them. She pulls them forward slightly. She stands up and rearranges her chair. What strange ritual is she about to perform? Suddenly

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from her voluminous skirt she produces a book and proceeds to enjoy "Jane Eyre." She has devised her own method of combating the lighting shortage!

Part II—"The Walrus"

He is a small man. His face is yellow and crinkly like a walnut. His shiny bald head, high "George Robey" eyebrows and long white drooping moustache cause him to be nicknamed "the Walrus." The facial resemblance is the only one, however, as he is reputed to have no particular love of water in any capacity. He has been "a resident" since the second year of the war when a German bomb robbed him of his house and his housekeeper. He appears to have no relatives but lives in a world of books and crossword puzzles. His only apparent exercise is reaching the dining-room before anyone else, and this he invariably accomplishes. His unsteady hand and straggling moustache have combined to record irremovably on the front and lapels of his black jacket his dining-room attendances. In spite of these blemishes, his white shirt and black bow-tie betray his former profession—a lawyer. The odour of musty documents seems to linger with him still, although it must be many a long year since he entered up in a well-used ledger: "Meeting with you and advising re new 'claws' in your Will—7s. 6d."

He sits down at a small table laid for one, in the centre of the room. His slippered feet barely reach the floor. He places his hands by his side, clutching the end of the chair like a child who is afraid of falling off, and looks straight ahead. The old waiter comes shuffling up. "Soup, sir?" "What did you say," says the Walrus. "Do you want soup, sir," says Albert in a slightly higher tempo. "Yes, yes," says the Walrus, a bit short tempered. The soup course is then dribbled through, and the Walrus resumes his original stoical pose. Albert returns and whips away the plate. He shuffles back with the next course. The Walrus surveys it apprehensively. "Do you know what it is?" he queries sharply. "Hot-pot, sir," replies Albert, with pride. "All right," resignedly mumbles the Walrus. Albert proceeds to serve the vegetable. As soon as the Walrus realises what is happening he calls out, crossly, "Stop, stop, you're sopping up all the gravy." Albert repentantly pushes the runner beans to the side of the plate to conserve what remains of the treasured liquid. The mashed potatoes are carefully arranged round the edge of the plate. Albert retires. The Walrus goes into action. The whole artistic effect is quickly lost when the Walrus attacks from the outside; the battlement of potatoes collapses and the gravy quickly seeps through the soft dry potatoes. Apparently this was as the Walrus had planned, as something as near approaching a smile as has ever been seen to emanate from his stolid countenance sweeps its way over the wrinkles on his shrivelled old face. Albert shuffles off with a shrug of his shoulders. This second course completed, the Walrus relapses into his waiting pose for the third time. Albert is by his side again. "Jam roll, sir?" "Jam roll again?" queries the Walrus, and with almost a break in his voice mumbles, "I'm sick of jam roll." Albert takes a step back and hangs his head in shame. "All right, bring me some," directs the Walrus on reflection. On the jam roll being produced he proceeds to dispose of it with the look of a sulky child. The jam roll disappears. The Walrus slithers from the dining-room. The other diners relax. The entertainment is over until next meal-time.

Part III—"The Victorian Lady"

She is petite, sweet and seventy, and as fragile as a piece of Dresden china. Her pure white hair is swept up into a small knot on top of her head. Her grey suit is well tailored and her small sailor hat is reminiscent of the "Gay Nineties." She is rarely seen except at meals, which she attends with dignified ceremony. At dinner she drifts in like a skiff borne along by a soft breeze. Her black dress is high necked with huge puff sleeves and tightly fitting bodice. The full skirt sweeps the floor. As she sails past, a faint perfume of lavender comes sifting through the mixed odour of furniture cream and roast potatoes already permeating the room. She turns and gives a queenly bow to those guests with whom she has already passed the time of day, and seats herself with dignity at her table, under one of the few lights in the room. The light reflects the silver pattern on her black taffeta dress, and she sits there like a lone twinkling star in a darkened sky.

Only the fortunate few who have held conversation with this gracious lady and to whom

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she has imparted a few facts of her life, can understand how she comes to be living here at all. A more fitting setting would be a Victorian drawing-room, sipping tea from egg-shell china, or leisurely perpetuating the seasons on a delicate sampler. Seeing her in this modern world is like visualizing a Raeburn in a passe-partout frame.

She is married. On the second finger of her left hand she wears a wedding ring, although it is almost entirely obscured by several large stone rings of the variety one sees discarded but highly priced in a secondhand jeweller's shop window. She has a husband. Her conversations invariably commence with " If my husband were here." The listener is puzzled. Why is the husband of this sweet old-world lady not here? He has never been known to visit the hotel. She occasionally mentions her " boy friends." Is it possible that some scandal blemishes this lovely picture? One is so completely carried away by her conversation that it takes some time to realize that she really means *boy* friends. She is talking of fifty years ago, however, and the present whereabouts of her husband can be conjectured when she casually remarks that he has been dead for thirty years!

Part IV—" The Pendulum "

He is middle-aged, tall, with slightly bent shoulders, thinning grey hair, fresh complexion and a sharp beak-like nose. His business-like dark suit and spotless white collar give the impression that he is about to attend a meeting of the Board of Directors, except that his gait is slightly less sprightly than is expected of an active business man. He is obviously a retired business gentleman. Among the resident guests he is looked upon as a " regular." His strong Irish accent betrays his nationality. He is probably another victim of the blitz, rearranging his family fortunes prior to returning to end his days in his " dare old County Cork." His sister, who sits opposite him at meal times, is a spinster, sixtyish and wiry. He generally gets to breakfast a few minutes after her. He looks over the table. " No cups," he observes in a loud tone. " They're coming," remarks the sister sharply. " Is this the ration?" he comments, lifting up the small jar of sugar. " No, that is mine," the sister replies, " I have used some for my porridge." This conversation is carried on as though they were both stone deaf and were seated at opposite ends of the room. Thus twice thwarted in his morning grouse, he relaxes and sits back, staring into space. He is roused from his reverie by the kindly tones of the waiter who remarks "Good morning, sir. I think it is going to be fine today." " You said that yesterday," replies the Pendulum, "and it was raining inside an hour." The meal is then proceeded with in silence. The Pendulum has had his morning moan.

Each evening at eight o'clock he takes up his position in the narrow passage which runs past the lounge, dining-room and offices on the ground floor. With hands in pockets, pipe in mouth, and head slightly forward, he maintains a steady pace and walks the full length of the passage, slowly turns round and walks back again, sucking his pipe and jingling his money, apparently deep in thought. Anyone passing him must walk crab-like to avoid going straight through him, as he never seems to notice anyone, but goes back and forward with the regularity of a pendulum. Sitting in the lounge one can gauge his position by this jingling sound. The jingling comes nearer; he is approaching the door. Then it ceases. He has stopped. Is he listening to what is being said? One of the guests is relating that she is really on a secret mission for the Government but that she doesn't want anyone else in the hotel to know, as it might spoil her plans. This proves too much for the Pendulum. He pops his head in, looks quickly round the lounge, and disappears into the passage again. Is he an informer? Is he too on some secret mission? No. He is just an inquisitive old man who didn't see the mischievous wink in the eye of the lady with the " secret mission "!

Part V—" The Antelope "

He is tall and slim. His thick fair hair has the appearance of being continually windswept. One might call him graceful, if such an adjective could be attributed to his sex. To see him come up a flight of stairs is like watching an antelope scale a mountain. He comes up with enormous strides, and when he reaches the top, he pauses for a moment with his head held high like a deer silhouetted against the horizon on top of a peak. His entry into the dining-

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room he makes with no less speed and grace. The door opens and a body sails through the room. He appears to cover the distance in one movement. One scarcely notices how he manœuvres between the tables. He seems to skip over them, and comes to rest on the chair, his long legs draped across the passage. He puts his hand into his pocket and with a flourish of his long arm a book springs up in front of him apparently already open at the required page. He feels for his knife and fork and proceeds through each course " Braille " fashion, his eyes never once leaving the book. The meal finished, with a wave of his arm he closes the book, straightens himself, makes a cursory glance towards the door as though measuring up the distance, and in one leap has left the dining-room.

Like the antelope he is elusive, and only at tea-time, when he is cornered in the small lounge, does he ever relax and drag himself away from his books. The secret of his apparent disinterest is that he is one of the many unfortunate ex-officers who, after spending so many war years in highly skilled and important jobs, now finds himself thrown on the labour market with no civilian qualifications. He is studying architecture and finding it a full-time occupation. His army life, which he recalls wistfully, had its climax at Arnhem. His best story of those days tells of how he was in charge of a party of men who were part of the force which was pressing on towards the bridge to relieve the hard-pressed airborne troops. It was dark. They were crawling along the river bank. On the opposite side of the river was the enemy. The men were carrying mortars. Knowing that even the flick of a finger-nail on the mortar causes it to resound like a gong, he had impressed on his men to be careful, as the slightest noise would give away their position. He was in front, slowly and silently leading the way. Suddenly there was a terrific "B-o-n-g" which resounded up and down and across the river. He turned round quickly and in no uncertain army language demanded to know who had caused it. Quickly there came back the reply, " It's all right, sir, Jerry will think it's just struck one o'clock "!

Conclusion

These impressions are written after living a few weeks in what appears to me to be a strange new world. To me, Station life and the companionship of Service friends meant a great deal, and if at times I miss these things I just look around to find a new personality to interest me, and I feel somewhat recompensed in the wealth of character study which my new abode affords me.

H*

Nothing Doing

by B. J. Hurren

THE satisfaction arising from a nostalgic and perforce not unsentimental journey is acute —like the sting of the sun in Cairo where I now write. Here, the nodal point of immense political conflict, life outwardly flows with the colour, heat, dust and, above all, noise that several hundred thousand British troops learned during the Second Great War.

Impossible to have visited Cairo and remain unaffected by the scene for ever after. More than a million of the Arab world live in this metropolis which, from the air, appears so much like a cardboard city. The vast emporiums (now stacked with goods made in England but there unobtainable); the ferro-concrete edifices; the long, straight sharias that might easily be boulevards transported in toto from Brussels, Paris or Rome; the stately clubs and the swank restaurants; the baroque nightmare that is Shepheard's Hotel and the Gezira Sporting Club that might just as well be Ranelagh—all these form but the façade to an Haroun al Raschid background of filth, squalor and the meanest form of human life that, like newly hatched frog spawn, teems ceaselessly and questfully throughout ten thousand byways where everyone is a salesman in something, be it as small as a razor blade or—as I will relate—as large as a tram.

I came to Egypt by flying-boat, one of the new Hythe Class of British Overseas Airways. Across France and across the Western Mediterranean to

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Augusta, in Sicily where, superficially, the serious business of the moment is water-skiing; and then on over the Maltese waters to Derna and the Western Desert. Uncle Mac, or more formally, Mr. Derek McCulloch, O.B.E., Director of the B.B.C. Children's Hour Programme, was on board with a recording apparatus which claimed the attention of all the passengers and crew during the trip. Alas, how time has invested that grim and sweltering sea of sand from Benghazi to the Nile with a sentimental affection that certainly did not exist when the Afrika Korps pitted itself against the Desert Rats! There, down below, was Tobruk, lapped by the vivid blue waters and now simmering peacefully beneath a searing sun. Still in the harbour are the wrecks of ships: I counted fifteen, but for the rest the place seemed a deserted town. Difficult to believe the great dramas played out at this spot which, no bigger than a small English town, at one time captured the world's headlines.

Behind, up on a slight plateau, extends the wilderness; that surrealist stretch of barren limestone and dust described so vividly by a French journalist as "ugly, jaundiced, the resort of vultures, a livid and suppurating sore." All is quiet on the Western Desert now: the columns of dust that plumed like ostrich feathers as a squadron of tanks progressed across the sand or as aircraft took off no longer rise. Fearful of minefields, the bedouins keep to recognized tracks, taking care to drive first their animals and then their women in front of their cautious advances.

Down to the serrated coast, where a thousand small bays provided bathing beaches for burned troops and a bridgehead for commando raiders, extends from the desert hinterland a series of straggling threads—the paths of cars unchanged even though four years have passed since first they were made. And then, in a cluster near Halfaya ("Hellfire") Pass stand out a series of macabre monuments to gallantry, the charred remains of modern chariots of war—lorries, tanks, aeroplanes, cars, motor-bikes, a scrap-heap testifying to now forgotten scraps of the utmost desperation. That scene is repeated all along the road west to Mersa Matruh, punctuated at infrequent intervals by tin shanties which once served as mess quarters and Ops. rooms to armies severed entirely from the trammels of what is called Civilization.

And so on across the sand sea to Cairo, the tawdry and splendid city, largest of all under Arab dominion, where West marches side by side with East and the twain mingle in an extraordinary tangle of *chic* and sham, where Bond Street's smartest cut vies, often vainly, with the careless splendour of a sheik's silk robes. On that great greasy green serpent known as the Nile, significantly British Airways flying-boats ride at moorings with wings almost touching the ungainly yet romantic fellucas and dhows that have borne the trade of Egypt since time immemorial. For here in Cairo not only does West meet East, but the incalculably Old meets the preponderantly New.

Nothing, not even the wildest of Arabian Night stories, is beyond possibility in Cairo, where the discerning observer can view the passing pageant with kaleidoscopic delight. Indeed, one would wish for a producer to stage at the Palladium in London no more than the daily scene in Cairo for a prolonged success, since nothing could possibly exceed in amusement that which actually takes place by routine here. The title of the revue could well be " Nothing Doing."

On the veranda before the main entrance to Shepheard's there is now an extraordinary absence of khaki uniform. But Yesterday, and here thronged thousands upon thousands of Allied officers of all categories: I have even seen a Chinese Admiral here, whilst Major Mundays and Colonel Chinstraps were so common as to be almost unnoticeable. (There were said to be 683 superfluous colonels in Cairo alone during 1941, but that may be one of the stories of war.) All that has gone: yesterday lunchtime there were no more than three people in the back bar, a half-dozen in the lounge, and five in the front —and the minority of these were English.

On the veranda I sipped a long and cooling whisky, and laughed to recall forgotten tales of Cairo. Not the everyday affairs such as injecting water into water-melons to make them weigh more, nor inserting a small bar of lead down the gullet of a mullet with the same end in view, but the more ambitious efforts which quite put to shame the confidence tricksters of the western world. I remember, long ago, a pasha who had six sons, all of whom had been educated at English public schools and sent on to Oxford or Cambridge. I was present on the occasion of the return of the youngest son, always something dear to the mind of an Eastern parent. This very likable young chap was just twenty-two. He had been educated at Harrow and Trinity College, Cambridge, but his father, with that hopelessly despairing *moue* that so closely resembles the disdainful sneer of a camel, complained to me: "I wouldn't trust him with a business deal this side of Gibraltar."

And, perhaps, rightly, for listen to the tale of the man who sold a tram. Some of the Arab chiefs are not only exceedingly wealthy but they are also fantastically trusting. They come, as it were, after a heritage of double-dealing, double-crossing, graft and counter-graft to the eminent

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state of being so complex that they are simple. It was one such Arab who was seized upon by a Cairo city slicker of fair words and unending blandishment that so far transcended the charm of even the blarniest Irishman that it was small wonder the coup was brought off.

Observing that the conductor was taking money almost non-stop, the city slicker persuaded the elderly Arab that what he wanted most was a tram. The money came in non-stop; it was all so simple, as the people paid without question. He was taken to a tram depot and shown an assortment of trams, then invited to select which one he wanted. For only 10,000 piastres, or approximately £100, he could buy one of these and rapidly recoup his outlay and thereafter sit back in luxury for the rest of his life.

The deal was done and, delighted with his new purchase, the Arab solemnly sat in his tram which, being well down the line in the depot, did not depart for a long time—much to his annoyance. But when at last it did take off, how carefully he watched the conductor! How he cunningly counted the number of passengers, and swiftly calculated the potential earnings of the day. Of course, when the conductor asked him for his fare he expostulated, telling the man in old-fashioned Arabic not to be silly as it was his own tram and if a man cannot have a free ride on his own tram who the heck can? However, as the conductor was insistent, he grudgingly paid a fare, saying to himself that this was quite all right since he was only paying it to himself anyway. There, throughout the long day, he tirelessly remained, with, perhaps, one or two untoward exchanges of opinion with the conductor, who had privately decided he had a lunatic aboard.

When the long and dusty day ended, the tram went back to the depot, and the hugely delighted "owner" moved to take in the winnings. And then began the battle royal: for everyone in Arabia knows that the argument goes generally to him who shouts the loudest in proof of the justice of his cause. Noise in Egypt is like honey to a fly: none can resist the attraction of a shouting match in which terms too dreadful to print obscenely described the characteristics and habits of the contestants. In no time a huge crowd had collected, as the frantic "owner" tried to collect his takings in vain. The dispute led to a riot, and a bored journalist vaguely cabled home that another demonstration had taken place. The "owner" was jostled to the cooler, and now sits darkly brooding on how to recover his money from the city slicker and how to work the trick on some other sucker.

But this simple story of deception has many variations. I recall the incident when an American Army lorry ran into a gharry. It was entirely the fault of the gharry driver, since in Cairo the only law of traffic is that you should get your nose in front of every other vehicle, and may the best man win. In this instance the gharry was smashed to smithereens and the curious quadruped which bore much resemblance to a skeleton horse was killed.

At once a huge crowd assembled, all shouting and yelling in a frenzy of excitement. The lorry driver was perforce hemmed in by the mob, and only with difficulty and the generous application of staves did the police eventually force their way to the centre of the accident. And there, stretched out on the ground, before a weeping gharry driver, was an Arab, one of the swarming fellahin class who daily court a short cut to paradise by walking across the road.

Alas! The tragedy was not as bad as it appeared, for the police doctor discovered on even a cursory examination that the man had been dead at least twelve hours and rigor mortis had long set in. For in the excitement of the moment some agile brain had conceived the idea of substituting a dead man from an adjacent house for the passenger—if there had been a passenger—with the praiseworthy idea of claiming compensation.

And then we have the almost incredible story of the defence raised in a case common enough in Cairo. The defendant, proprietor of a smart night-life restaurant (with cabaret), had been caught watering the whisky, a simple way of making profit since the military authorities had pinned prices. His plea was eloquent and artful. It went after this fashion: I am so glad that we have the British on our side. I want to see the war won quickly. I therefore want every officer to do his best. An officer's efficiency can be impaired by alcohol. Therefore, I dilute the alcohol in order to help the war being won by the brave British.

Ingenious in approach, Levantine in its subtlety, still the magistrate was not swayed, and the offender was fined a considerable sum of money and his boite was closed for three weeks.

Now, many officers and their ladies had bookings for this boite, and on its closure they were forced to go to the next, and only rival, establishment. The result was easy to foresee, and perhaps had been imagined by the delinquent, for confusion and chaos reigned in the rival joint, and such was the degree of over-crowding that in order to keep officers' parties under even some sort of reasonable control the first establishment had to be reopened before even three days of the three weeks' closure had run.

None of these stories matches the incredible

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ingenuity of the Cairo murder gang which, despite their gruesome trade, seemed to embody a certain degree of humour of a sardonic nature. Most amateur murderers find themselves—after the deed has been accomplished—with a corpse on their hands, and, as has so often been shown, the disposal of the body in the crime raises great complications and frequently leads to the murderer. Whether the murder gang appreciated this fact or whether they just arrived at the answer as a natural process of Egyptian thinking it cannot be said, but this was what happened.

The victim, carefully marked down, was decoyed to some side street, probably on some pretext of illicit gain, for above all in Egypt money is the root of all evil. Having successfully "knocked off" the victim, the disposal of the body was simple. Under local custom, the body of a dead person is placed in a large wooden box, to the base of which are prolongations not dissimilar to those found on a sedan chair. With these supports, the coffin can be carried, and loyal relatives (in genuine burials) take their turn at shouldering the burden of the departed. The coffin is heavy, and it is a recognized procedure for the bearers to become fatigued and to allow any of the mourning party to step into their place.

You can imagine what happened. The murdered man is installed in the coffin, and the wailing party of mourners sets out from the house of death to the burial place. Woefully chanting as they pass through crowded streets, the riff-raff population joins in the procession, each anxious to take a short spell bearing the body, since for this trivial service they can collect a reward at the funeral feast. Of course, one by one the murder gang would slip away, until the bearers consisted of a band of people going they knew not whither and carrying a corpse of whom they had no knowledge.

And so the pageant passes on. Only in the heat of the day does it relax in part, and the "peek-peek" of the taxis through three octaves become subdued and wait, like frogs, to croak with the coming of cooler evening. Noise, the sixth sense of the Egyptian, dominates all, and the blare of hooters and klaxons continues unremittingly in the background, shrill and discordant, of the street pedlars of whom there must be several hundred thousand.

Persistent, unrebuffable, tenacious, determined they beset the paths used by foreigners. Shall I try to imitate their words? The intonation really makes them realistic, and they should be read as though a dirge were being chanted without inflection, yet persuasively, coaxingly, even reasonably, as though inviting counter-argument.

"Pleese." They always start with politeness. "Pleese, Groupers Captains Collonnells, you want something ver' nice? You want razor bladè? You want comb? You want *Egyptian Gazette*? *La Bourse*? Pleese, Collonnells, you want see native dance, ver' nude ver' naked? You want bazaar? I give you taxi, Captains? Pleese, Groupers Captains, I give you nice shoe-shine?" And seeing that these tempting offers fail to move you, the artful tempter goes further, producing by some legerdemain a small phial which, in a fleeting glance, you observe contains some white tablets and which you feel intuitively must be some form of dope pills. And then the master salesman titilates your curiosity with a highly confidential whisper, reminiscent of a hundred Oppenheim yarns, as he says "Spanish Fly? Ver' verrry guid . . ."

You shake your head to decline the tempter's phial, and indefatigably he returns to the charge: "Pleese, Collonnells." For some reason it is always the plural, and for some other reason the simple word Colonel has not yet been mastered. "Pleese, Collonnells, what you want? I give him, Collonnells, the ver' best in Cairo. *Aywah!*"

One day I may succumb, but so far the answer has been "Nothing doing," and those who have had perforce to accept this judgment have gone back to Cairo's greatest industry—doing nothing.

St. Dunstan's and the R.A.F.

Since last May home and overseas commands of the R.A.F. have raised £131,180 10s. 6d. for St. Dunstan's, and the whole of the money is to be spent in various ways over a period of forty years, in the interests of men and women blinded on war service.

Part of the money is to be spent on establishing, furnishing and maintaining a club at the St. Dunstan's permanent headquarters in London. The club will be called St. Dunstan's Club and a plaque will be placed in it commemorating the R.A.F.'s gift. When this is established the possibility of setting up similar centres on less ambitious lines in big provincial cities, such as Liverpool and Manchester, where there are numbers of blinded ex-Service men and women, may be considered.

It has also been decided as an experiment to set up in the spring of 1948 a holiday home for the children of blinded soldiers, sailors and airmen, with the object not only of giving the children themselves a holiday but also of enabling their parents to take a holiday with greater freedom. Accommodation will also be provided there for children during brief periods when there is illness in their own homes or at such other times as it is considered desirable for them to be away.

If this experiment proves successful, as it is believed it will, the holiday home will be continued, and much of the R.A.F. fund will be absorbed in this way.

All R.A.F. stations at home and overseas assisted in raising the money, and special efforts were arranged, including sports, fetes, concerts and whist drives, to some of which the public were invited.

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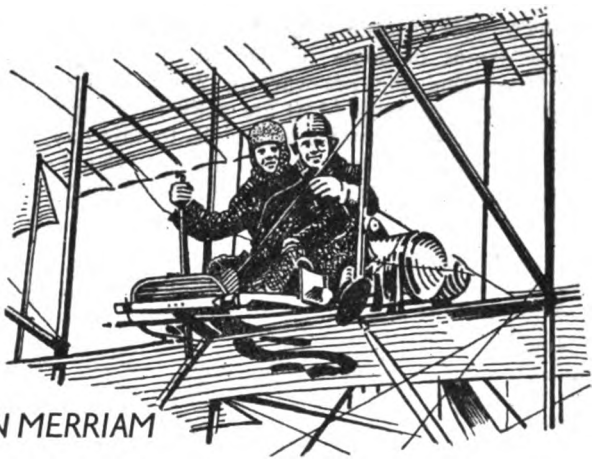
Memoirs of an Early Flying Instructor



by
Lieutenant Commander (A.) F. WARREN MERRIAM

(*Continued from page* 227, *Vol.* 17, *No.* 4)

X.—CHINGFORD R.N.A.S., 1915-1917
(*Continued*)

AS I have already mentioned, the Royal Flying Corps had taken over the Air Defence of London, under the command of General Ashmore, a pre-war pupil of mine. This released the R.N.A.S. from night flying operations, so, with evenings free, or sometimes when the weather was wholly unfit for training, I availed myself of the opportunity of visiting the Royal Aero Club. One saw it in a very different aspect, too, for with the exception of a few mufti-clad notables, such as F. Handley Page, Tommy Sopwith, C. R. Fairey, Howard Wright, Griffith Brewer, Bill Adams (first aviation insurance broker), and others, all of whom were engaged upon important work at home, every member had donned uniform. There, also, deputizing for Commander Perrin, who was occupied in a new role, could always be found Mr. B. Stevenson. I can still picture his benevolent person just moving into the new Club quarters, jealously guarding the Club's data, and carrying on the good work for aviation.

Wing Capt. Gerrad, who had been with us at Chingford for nine months, left to take command of the Western Area, and Commander C. R. Dane succeeded him. I was surprised one morning to be informed by him that I was to go up for a medical board, and particularly for an eye test, after which I was to report to Sir Godfrey Paine at the Admiralty. Sir Godfrey was then Director of Air Services (Naval).

My first discovery on arriving at the Board was that I was to be tested by the same oculist who had turned me down before I had my commission, and I was not long in knowing his attitude towards me. On going straight from him to Sir Godfrey Paine, who had already been discussing me on the phone, I was told the worst—that was, that my flying was to be stopped. I naturally felt terribly upset at this, and had the real sympathy of Sir Godfrey, who had been fighting hard for me to be kept on flying, for he had known me since the pre-war days when I used to fly over to Netheravon. He knew I was not to blame for my previous unfortunate accident and he personally told the Medical Board so.

We then discussed my future in the Service and it was decided that I should go on the Staff under Wing Captain Gerrard, on the West Coast.

As I made my way back to Chingford, it occurred to me that, after all, no man is indispensable and perhaps this enforced rest was for me a blessing in disguise. This, it undoubtedly proved to be.

Commander Ward and the staff honoured me with a farewell dinner. I was deeply impressed by the general sympathy of everybody with me in the misfortune that had brought about this quite unexpected parting. Everyone deplored the cancellation of my flying. The pupils and my assistants were no less sorry to bid farewell than I was myself. I gave my sincere thanks for all the kind things they had said and expressed my regrets at having to leave them.

From the time I commenced as an instructor at Brooklands till the end of my period at Chingford, roughly 900 pupils had passed through my hands. Like the Bristol School at Brooklands, Chingford, on the whole, held the highest reputation for the production of first-class pilots.

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As a point of interest, the following list represents names of some of the war-time pupils (not counting the pre-war) of early Hendon and Chingford days. Most are actively engaged in aviation, both service and civil, to this day, and are still particularly well known. (Ranks and decorations are as at the time of writing—1936.)

The late General R. M. Groves, C.B., D.S.O., A.F.C.
Air Vice-Marshal F. C. Halahan, C.M.G., C.B.E., D.S.O., M.V.O.
Air Vice-Marshal Sir Charles Lambe, K.C.B., C.M.G., D.S.O.
Air Commodore L. D. D. McKean, O.B.E.
Air Commodore L. E. Goble, C.B.E. (the first man to fly round Australia).
Air Commodore P. F. M. Fellowes, D.S.O.
Air Commodore R. Leckie, D.S.O., D.S.C., D.F.C.
Lieut.-Colonel Hyde-Thompson (of the Hyde-Thompson Memorial Prize to Aircraft apprentices).
Group Captain R. M. Field.
Group Captain F. G. D. Hards, D.S.C., D.F.C., p.s.a.
Group Captain K. C. Buss, O.B.E.
Group Captain A. C. Wright, A.F.C., q.s.
Group Captain C. Murray, O.B.E.
Group Captain R. Graham, D.S.O., D.S.C., D.F.C. p.s.a.
Group Captain F. E. P. Barrington.
Commander W. L. Elder, C.M.G.
Commander Bird, O.B.E.
Commander Gerald Aldwell.
Commander Pemberton Billing.
W./Commander E. J. Hodsoll, C.B.
W./Commander J. P. Coleman, A.F.C.
W./Commander G. E. Livock, D.F.C., A.F.C.
W./Commander C. B. Dalison, A.F.C.
W./Commander C. L. Scott, D.S.C.
W./Commander J. C. P. Wood.
W./Commander L. C. Keeble.
W./Commander W. H. Dunn, D.S.C.
W./Commander H. S. Kerby, D.S.C., A.F.C., p.s.c.
W./Commander R. G. Gardner, D.S.C., q.s.
W./Commander P. D. Robertson, A.M.
W./Commander S. R. Watkins.
W./Commander G. W. Bentley.
W./Commander L. G. Maxton, A.F.C.
S./Leader G. F. Smyle, D.S.C.
S./Leader J. S. Fall, D.S.C., A.F.C.
S./Leader R. F. S. Leslie, D.S.C., D.F.C., A.F.C.
S./Leader R. P. Whitehead.
S./Leader T. H. England, D.S.C., A.F.C.
S./Leader F. J. W. Mellersh, A.F.C., p.s.a.
S./Leader C. A. Rea, A.F.C., A.M.I.Mech.E.
S./Leader C. H. Hayward, p.s.a.
Major Stewart-Dawson, D.S.C.
Major C. J. Galpin, D.S.O.
Major F. T. Digby D.S.O., D.S.C.
Major A. Q. Cooper, D.S.O.
Major A. Keiller.
Major H. G. Brackley, D.S.O., D.S.C., F.R.G.S.
Capt. Norman Blackburn.
Capt. E. L. Gandar Dower.
Capt. H. J. Horsey.
Capt. V. Martin-Gwilliams.
Capt. W. Mann.
F./Lieut. Brian Millar, M.I.E.S.
F./Lieut. A. M. Blake, A.F.C.

XI.—R.N.A.S.: Manston, Cattewater and Padstow

Instead of being posted to Cattewater as I had expected, I was ordered to report to Manston, and I took up my new duties there as a senior officer on the Intelligence side.

My duties largely embraced the supervision of all flying, and at this I was naturally most at home.

Manston was a patrol station and will be remembered as a very hot place for enemy raids. Bombs dropped in that vicinity pretty frequently.

There were many young flight officers at this station. It was a good place to get them gradually accustomed to air fighting prior to sending them over to the other side.

Flight Lieut. C. Fitzherbert was one of my many pupils who were very active on these patrols.

Flight Lieut. Lord Ossulston was also engaged on the same work. We two shared a little secret which by this time is so well cooked that no harm can be done in raising the lid!

Although we had never met until at Manston, Lord Ossulston had heard a great deal about me, for one of my pupils, Flight Lieut. A. B. Watkins, had taught him to fly. Knowing that my flying as a pilot was barred made him tremendously sympathetic towards me.

One day he expressed a wish for me to take a flip with him on a dual-control machine. He knew that it was against the grain for me to fly as anybody's passenger, other than my own pupils', but I twigged the meaning of a suggestive twinkle in his eye. In taking off he asked me to take control. On this flight I gave him the little tuition which was what he was really after!

It was some years after the war that I again met him when he paid a visit to my flat in London, after which he wrote me, saying:

"It was such a pleasure to see you again after such a lapse of time—eight years, I think—and also to have had the pleasure of meeting Mrs. Merriam.

"I have never forgotten our trip in the old Avro at Manston, for although of only thirty minutes' duration I can confidently say that, in that short time, I learnt from you more about the 'gentle art of flying' than in many hours of flying previously.

"The little hints and tips which you gave me then were invaluable to me later when I myself had the responsibility of training pupils in the air."

Soon after the date of this communication,

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when aviation was so quiet, he courageously struck out on his own enterprise, becoming a private owner of aircraft, and he generally helped gallantly to keep the country air-minded.

My stay at Manston terminated after about a week. Some error had occurred and it was discovered that I should not have been there at all, so I was transferred to Cattewater R.N.A.S. Seaplane Station, where Sir Godfrey Paine intended me to go in the first place, and where anti-submarine patrols were carried out.

My duties were in the same category as at Manston, only, of course, it was a welcome and novel change from landplanes.

Capt. West was in command of this station, under Wing Captain Gerrard, whose headquarters were at Plymouth. Flight Commander K. Buss (a Chingford pupil) was also at Headquarters on the staff.

I had, from time to time, been surprised to hear from various pupils and others who had been sent for special seaplane courses at Calshot that they would much rather be on landplanes. They chiefly complained of the heaviness they experienced in handling seaplanes.

D. O. Thomas, describing his experience whilst at Calshot, said, "One has not the same feel with them and, in consequence, one is taught to fly by instruments." But then he had a string of irksome additionals in training to undergo which tended, I have no doubt, to take the polish off the real thing, for he complained also that "although the majority of us have graduated at Cranwell, we still have to carry on with lectures on such subjects as 'Anchoring a Fleet of Battleships,' and similar instruction which will be of little or no use to us."

Lance Sieveking described his new experience in a more humorous style, which was characteristic of him. He said:

"When I left Chingford, I went to Calshot where, after a little uncertain wavering about on Nieuport Monoplane Seaplanes, I decided that flying omnibuses was not the thing for me. So I tried to return to land machines—I was promptly sent to 'The Riviera' (more popularly known as 'The Terror of the Belgian Coast'), where the 225 Short amazed me beyond words. Never having seen one before, I had forthwith to take it off on a six-foot-wave sea outside the harbour of Dunkirk. I managed to do that, but landed some miles away from 'The Terror,' and taxied back to her full out, the prop cutting slices out of the floats and the white metal bearings running out like water to the accompaniment of the radiator, which by this time was pretty nearly boiled dry. After several more dramatic exhibitions, I was ordered to . . ."

Others had similar exciting experiences at that time, whilst my own were yet to come. It was rightly said by many that they were afraid they would hardly know what to do with themselves if they had to stop on the ground all the time. It was really an experience after the years I had put in in the air, to stand by and witness pilots taking off. Was there any wonder that I became envious and dissatisfied?

I was seriously contemplating putting in for my discharge on the grounds that I should be much more useful to my country in civilian life as a test pilot.

Our C.O. understood me perfectly. He was one of the good old naval sort and very broad-minded about flying—in fact, he was anxious to learn to fly himself. He prevailed on me to have patience and tolerate my lot whilst he thought out some possible way of smuggling me back to flying. Meanwhile, at his advice, I was medically examined at the R.N. Hospital, Devonport.

Then began a lot of correspondence on my behalf—a kind of a "Private told the Corporal, the Corporal told the Sergeant" procedure, headed by an application from Capt. West to Wing Capt. Gerrard, on 28th August, 1917, which read:

"Sir,

"I have the honour to bring to your notice certain facts concerning Flight Commander Merriam of this station.

"This officer has taken over charge of machines and is of the utmost assistance owing to his great experience of aviation. I understand that he is not allowed to fly on account of defective eyesight. This fact is weighing very heavily on his mind.

"In view of this, I arranged with Surgeon General G. Turner for Flight Commander Merriam to be examined at R.N. Hospital, Plymouth, and enclose the result of the examination. I would suggest that this officer may be allowed to fly again, in which case I should be very glad to be his passenger.

"His one great idea in life is aviation and the fact of (after so many years of good work) being relegated to ground work is a source of great bitterness to him.

"I would further submit that Flight Commander Merriam's services as a Flight Instructor would be of greatest value."

As regards the ophthalmic report which accompanied Capt. West's letter, it summed my case up in the following words:

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"That the vision acuity unaided is distinctly below normal (owing chiefly to corneal nebulæ, which are faint) cannot be gainsaid, but it is my opinion that too much stress is laid on direct visual acuity to the extension of peripheral vision which, in this case, is good. In any case, the fitness or otherwise for instructional duty is a decision which ought to be arrived at by those capable of judging the past record of this officer and ought not to be unduly prejudiced by ophthalmic opinion alone. I state this the more confidently as this officer's visual acuity is similar to my own unaided vision and I should not hesitate to trust myself to his care, as far as visual acuity is concerned."

Wing Capt. Gerrard then submitted Capt. West's letter and the medical report to the Commander-in-Chief, Devonport, with the following:

"Flight Commander Merriam was a well-known pilot before the war and was a very successful instructor with the Bristol Company in 1912, 1913 and 1914, during which period he taught a large proportion of officers joining the R.N.A.S. and R.F.C. In 1914, he joined the R.N.A.S. and was employed as an instructor at Hendon, and subsequently at Chingford, until about June, 1917, at the latter, under my command for some nine months. He continued to be most successful and taught most of the best pilots in the R.N.A.S.

"It is understood he had a bad smash about June last when making a cross-country landing due to engine failure. Any pilot is liable to such an accident occasionally, however. Merriam is able to fly any type of machine, either by day or night, and personally, I have every confidence in him as a pilot.

"I would suggest he makes some trial flights without a passenger and that a report be obtained from Commanding Officer, Cattewater, on these flights."

The C.-in-C. approved this course.

Stunts on a Seaplane

Having been suspended from flying for four months, it would be difficult to describe my great joy when the moment actually arrived for me to make my trial flight. I was so overwhelmed, in fact, that it would have been possible to have forgotten entirely such an audience of air critics, with the C.O., as had assembled on Cattewater jetty to witness the event, had not the seriousness of the situation gripped me very forcibly. Their presence put my feelings of jubilation into reverse gear for I knew my fate if I failed to do my stuff.

Before telling my yarn about this flight, it is only fair to myself to point out that I had never before flown a seaplane, neither had I been a passenger in one.

The ordeal began as soon as I had boarded the 130 h.p. single-seater Baby Hamble Scout and was lowered by crane to the water, where I started the engine by means of the starting handle inside the cockpit and taxied to a position to take off.

The pressing desire to make a good show and to master something quite different in the rudiments of flying, combined to keep me very busy for some minutes.

The first thing to impress me was the difference between the take-off of landplanes and seaplanes. I understood exactly the difficulties my pupils had had in this respect.

The frictional resistance of the floats on the water was much greater than that of the corresponding wheels on land. The sea disturbances and tides, often contrary to the wind, would call for considerable practice to make perfect landings and get-aways.

With throttle full out I kept about fifty yards parallel with the jetty in order to give my observers a fair view of my take-off, which was effected quite normally.

I was fully aware of a large vessel with a tall mast before me, which was moored slightly to the right of my line of flying. The entirely new medium over which I was flying, and in fact, every other new circumstance attending me on this, my first seaplane attempt, had so fully occupied my thoughts that I failed to gauge the distance of the ship's mast and I should have struck it with the tip of my right wing had I not banked very steeply in the nick of time.

Having absorbed and sustained this momentary shock with one gasp, I continued to climb steadily until it was time to flatten out, but this, to my intense anxiety, was impossible. I was now on the verge of stalling and the control lever refused to go forward and flatten out.

Quick investigation into the cockpit showed me that after starting my engine up, I had forgotten to replace the starting handle in the loop which was provided for the purpose of keeping it secured, and it had now shifted into such a position that it was obstructing the forward movement of the control column. There was only one thing to save me from a crash, and that was to bring the control column sharply back, thus sticking the nose suddenly up, at the same time releasing the handle with

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my free hand. This was a very tricky procedure in my cramped position, for in order to reach the handle, I had first to undo my safety belt. All this called for instant action, otherwise I should have been spinning into the sea.

Now that I had emerged from shock number two, I proceeded without further trouble to enjoy a bit of old-style, unhampered flying, and finished up by cutting my engine off at about 2,000 feet and alighting almost on the spot where I had taken off, with such smoothness as to surprise even myself. They all thought I did very well.

One or two of the pilots who were watching me, remarked about the "cute stunts." They were, of course, referring in the main to my initial antics, and I did not disclose the secret of these impromptu stunts until a later date!

I carried out several more successful flights for observation, each of twenty to thirty minutes' duration. This resulted in the C.O. sending through the following report:

"Flight Commander Merriam has made six flights in Baby Sopwiths and Hamble Babies (seaplanes) in the presence of all pilots on this station. His flights were considered by everyone present as most satisfactory. He is undoubtedly the best pilot on this station."

This was submitted to the Wing Captain, who added his own observations and forwarded them to the Commander-in-Chief, Plymouth:

"I have personally witnessed three of these flights and, judging from the skill displayed by this officer in landing in a restricted space, I consider it is very evident that his flying abilities are not adversely affected by his eyesight."

The result of all this was a happy one for me, thanks to all concerned. I received this communication from the Admiralty:

"With reference to your submission of the 19th Sept., 1917, I am to acquaint you that the Board has approved of Flight Commander F. W. Merriam, R.N., of the R.N. Air Station, Cattewater, being permitted to resume flying as an instructor, by command of their Lordships."

I had, whilst at Chingford, put forward a request several times to be allowed to go to France, but it was always persisted that my services were far more necessary at home. Now that I had passed for flying again I was beginning to wonder whether I should be required to resume my old duties as an instructor. Not so, for to my great satisfaction, it was found that I should be useful for anti-submarine patrols, testing, and the general supervision of flying at Cattewater, which involved a great change from the long spell of school drudgery.

Anti-Submarine Patrols

This Station was solely for combating the submarine menace, which at this period, was threatening our country with the horrors of starvation.

The seaplanes for our use were mostly Shorts, fitted with wireless apparatus and bombs, etc., with accommodation in each for an observer. They were slow and heavy machines to handle, but reliable on the whole.

For the pilots who could manage them, there were also a few tiny, single-seater, fast Scouts, which carried a couple of 65-lb. bombs. There was only one pilot, however, besides myself, who used these, and that was Flight Commander Buckland.

These Scouts were very sensitive on the controls and tricky to handle when alighting on the water. In fact, on account of their frailty, a forced landing on a moderately rough sea would have been a serious thing. It was on one of these I always did my patrols.

During my non-flying period at this station I had been absorbingly interested in all the pilots' conversations regarding various appearances and habits of merchant ships and other vessels, as viewed from above, and, in addition, I had made a close study of the charts, which was an advantage to me when I started my patrols.

My first few patrols, according to my logs, were of fifty or sixty minutes' duration, and were without any startling events.

The story which I am going to tell now brings us to 29th September, 1917, and the date of my seventh patrol.

At this period of the Great War we flew even with the windsock straight out. There were days, though, on which the sea was pretty rough, and then it was deemed too great a risk to venture far over it, in case of forced landings. Moreover, our destroyers were also hampered on a rough sea, not because of its danger, but because its roughness hid the U-boats' periscopes from sight. These conditions, therefore, aided the enemy enormously to carry out a deal of dirty work uninterruptedly.

Not only were our merchantmen in great peril, but so also were our destroyers themselves under these circumstances, for they could more easily become the victims of the enemy.

Being free to fly at my own discretion and being guided by my own inspiration to prowl, I set off on one of these rough days to patrol, in the hope of finding a "sub." It was really

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an ideal day for my trip. The visibility was good and the clouds were about 5,000 feet high and were clustered unsparingly like huge bunches of white puff-balls, which afforded good conditions for hide-and-seek.

I had been reconnoitring for about fifty minutes when I espied a large merchantman majestically pursuing her course towards Plymouth. It was such a peaceful sight that it seemed incredible to me that at that very moment she might be hunted. I proceeded in her direction for the purpose of searching in the immediate vicinity.

Just before reaching her, I cut off the engine and spiralled down. On coming out of the clouds, I instantly spotted what looked to me like a submarine lying on the surface about a quarter of a mile distant from, and pointing to the broadside of, the vessel, apparently preparing to fire.

With my eyes glued on this newcomer, I continued silently to descend, evidently unobserved. Being now at about 1,500 feet over it, I was able to ascertain clearly that it was really a U-boat, and I saw two figures move quickly as if in agitation, on the conning tower. They had seen me.

I swooped steeply towards it, simultaneously fusing my bombs, and I dropped the first one on the conning tower from about 500 feet, just as it began to submerge. The second bomb I timed so that it would drop deliberately in front of the submarine as she disappeared under the water.

I restarted my engine then and circled the spot.

After the upheaval of the explosions had subsided, there was a noticeable amount of debris floating about. I am absolutely convinced that I sank that U-boat. There was no witness with me to support my claim. This was one of the disadvantages of flying a single-seater. Anyhow, I had the consolation of saving the ship from being torpedoed and she put in safely to Plymouth.

After I had continued to escort her for some distance out of the danger zone, I returned to my base and reported the matter. Having then refuelled and rearmed, I set out again immediately to inspect the same locality, but on the choppy sea I could detect no further evidence of the submarine. I was so thrilled by my success that I carried out two more long patrols on that day, lasting, in all, three hours and sixteen minutes.

Once I nearly bombed one of our motor launches for, from an appreciable height, until we became accustomed to them, they looked uncommonly like a submarine on the water.

We had orders to bomb at sight every submarine we could reach, except in certain prohibited areas where our own were operating; but even in these preserves, any submarine on the surface that started to dive when a recognition signal was made, was to be instantly attacked.

Bombing practice was another important side-line, but I looked upon this as a pleasurable necessity. Our armament officer, Lieut. Linnerman, gave me credit for good hits. I was very pleased about this.

Instructional work still came my way. An occasional seasoned officer would need a refresher course, or special instruction on landings.

Testing, too, was another great item. Seaplane engines were much less reliable than those for landplanes—I suppose because of the effect of the salt water—so we had to be doubly careful. I was up and down continuously at this job.

Our pilots and machines were getting overtaxed with work in consequence of the long patrols. I am sorry to say also that they did not always return.

Apart from these duties I often assisted the mechanics when there was so much work on hand, as well as supervising, as at this time the submarine menace was becoming so acute that merchant shipping had to be escorted in convoys by torpedo boats, destroyers or aircraft.

It was a fascinating sight to watch these convoys from above, proceeding up and down the Channel with two destroyers zig-zagging each side of them.

If, unluckily, a convoy had no escort, they themselves would pursue a zig-zag course, which was the means of dodging an enemy torpedo. This, however, did not always answer, and the loss of a brave crew of seamen and cargo of food supplies would often result.

I actually witnessed the sinking of a merchant ship one late afternoon off Start Point, on my return from scouting in the Dartmouth area. My machine held only just over two hours' fuel and I had already been out for over an hour when I spotted an object on the water in the distance. I made straight for it and then hovered low enough to see men taking to their boats. Their ship, which was already partly submerged, appeared to be sinking rapidly. They had been torpedoed. I dropped

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a bomb on an oily disturbance on the water about half a mile to their right and then flew to signal their distress to the nearest coast-guards' station; and then back again to the wreck, indicating with my signal lights to the crew that they were under observation for help. I continued to circle round them, searching for further possible signs of the enemy submarine, and released my other bomb as a parting shot.

My anxiety for their safety caused me to stay out longer than I should have done. I was allowing a good deal, however, for the following wind to take me back to my base, but, unfortunately, it changed somewhat, and through shortage of petrol I had to make a forced landing when about four miles outside Plymouth.

This event marked my twenty-seventh patrol and was my first forced landing at sea. I spent some hours before help came. It seemed an eternity. I was in the act of firing my last Very light when, luckily, one of our Short seaplanes, returning from patrol, acknowledged my signal.

The pilot (who was, I believe, a Flight Lieut. Woolner) later told me that rather than risk a landing on that choppy sea in bad light, which would have been of little avail to me, he thought it better to pursue his homeward course and send immediate help.

It was practically dark when a small fishing smack came to my assistance and hung onto me until a tug arrived on the scene to tow me to Cattewater, which we reached just about midnight. I shall never forget that experience as long as I live. Having slipped a few times from the slimy floats of the seaplane into the sea, I was perished by the bitter cold of that November night and saturated to the skin.

The tug's skipper told me that he had had great difficulty in locating me in the darkness and that he had just given it up as a bad job when he suddenly sighted the small light of the fishing smack.

All's well that ends well, however, for despite the buffeting I got through sitting in the frail little scout whilst being towed, I was happy that she had no damage as a result of the adventure. I was also happy to learn that the seamen had been rescued.

It seems pretty certain that the enemy submarines detested aircraft, not necessarily for fear of what might be dropped on them, but because they were much more easily seen from the air than by the surface craft.

It has been acknowledged that very few submarines were destroyed by aircraft, the reason, no doubt, being that they were able to submerge so swiftly once they spotted a machine, which shows that aircraft kept them at bay.

When the Admiralty later awoke to the fact that aircraft—lighter or heavier-than-air—were an urgent necessity for the safety of our shipping, and made provision, it was discovered that convoys escorted by aircraft were rarely molested.

All the same, it took some time to reach this happy state of protection, and only just before the end of the war, two ships had been especially adapted for carrying aircraft, which goes to prove how long it took the Admiralty to become convinced of the importance of aerial co-operation.

Let us turn again to 1917, however, when we were at our wits' end to fight the U-boat menace. The Kaiser had issued an Imperial order for an unrestricted U-boat campaign, which meant that all sea traffic was in danger.

Responsible German naval officers had complete faith in the ability of their submarines to wreck thousands of tons of shipping a month by unrestricted warfare, believing that Britain would be starved into submission by such means. They were convinced that such a campaign would paralyse with fear two-fifths of the neutral sea traffic. They actually boasted, with mathematical calculations, the month, if not the day, when England would be forced to her knees!

Britain paid a heavy toll indeed, just as she came to do in the Second Great War, but she won through.

I was only at Cattewater for six months, during which time, besides my other various duties there, I flew miles and miles on these Baby Hambles and Sopwith scouts on anti-submarine patrols.

Mine were termed emergency patrols. Other pilots on the station were briefed for long and definite patrols on the heavier machines, chiefly Shorts, which were very tiring to handle in bumpy atmospheric conditions. I felt sorry for these pilots, who included Flight Lieut. W. B. Callaway, and Flight Sub-Lieuts. H. P. D. Lane and V. R. Scriven, amongst others. They did a tremendous amount of thankless work in this respect.

Being thus privileged, on account of my long experience, to fly at my own discretion, except when needed to act as escort in emergency, or to search particular areas where attacks were expected, I was able to be of real service to unescorted shipping, for it must be remembered that there were not enough protective surface vessels or aircraft for the job at that time.

It was a great joy to me to fly out and meet

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convoys, and it was apparent that they were no less delighted, for as I flew over them they could be seen on the decks waving, and when I switched my engine off, as I often did, I could hear their cheering to the accompaniment of brisk hooting from their sirens.

After these, or similar, salutations, I continued to fly around them at a considerable radius, until they were out of the danger zones. Then, as a farewell, I usually gave them a stunt or two.

We knew by personal contact with seafarers ashore how much these services were appreciated and of what moral importance they were.

I recollect also that searching for missing seaplanes gave me no small amount of unforeseen work, sometimes over rough seas, and although these items fail to make such exciting reading as a story of a mid-air scrap with the enemy, they were nevertheless arduous and anxious tasks.

DITCHED!

One day I had been ordered out very hastily on an emergency patrol and when well on forty miles south-west of Start Point, reconnoitring over the given area where U-boats were reported to have been seen, my engine began to splutter. At this distance I was, of course, completely out of sight of land. At the first warning splutter, I immediately looked about in the hope of sighting a ship in case I had to come down, and to my discomfort, there was not a speck to be seen anywhere on the water, so without more ado, I set course for base.

The engine became speedily worse and started an alternate series of erratic splutters and stops. In anticipation of further trouble I released my bombs to reduce the weight and to make for safety in case I had to alight.

The aircraft, however, refused to be nursed and as her revs decreased I was compelled to turn into wind to come down. Each time I turned the nose down at an angle to descend, and at about 10 feet from the surface, the engine would pick up again, thus encouraging me to rise. This up-and-down business was repeated two or three times.

The fact that she would only function in a descending angle warned me that the trouble was probably due to faulty carburation, which was afterwards proved to be the case.

If these antics could have been witnessed, I imagine they would have been quite spectacular and in similarity to that of a bird pouncing down after prey. There was not time, however, to think of such things then for the engine petered out altogether and I was compelled to land, after a final quick look around for the sight of any surface vessel. There was not one to be seen.

I turned off the petrol and switch before pancaking on to the water. If, with my delicate little machine, I had met it with any speed, it would have been all up with me. As it was, I was lucky to make a successful "ditching." Most of us have witnessed a seagull alight on a rough sea with its head held back and up, as if to avert crashing headlong into a wave. This is how I can best describe this effort. The waves I had to contend with were, I should estimate, six footers. Having got myself down thus, my immediate concern was to discharge some distress signal lights, which I did with the utmost difficulty, as the job of filling my pistol with cartridges needed two hands. Meanwhile, needless to say, I was tossed about in the most uncomfortable fashion.

No sooner had I sparingly sent up a few rockets when a huge wave engulfed the machine and an alarming cracking sound came from the rear of the fuselage. I struggled out of the cockpit on to the floats to keep the tail up, for I knew that, with a broken back, the tail would soon dip and the weight of the water on it would pull us under. My position was indeed desperate.

It was cold December weather and I was already drenched. My hands were becoming so numbed that I could scarcely feel the struts on to which I was hanging like grim death. Woe betide me if I slid into that sea! I could swim, but no swimmer could regain the machine in those circumstances. To make things worse, I had left my life-saving belt in my rush to get at the enemy submarine.

I felt that as long as I kept up, there was a slight hope of being sighted by some ship, so with the little feeling I had left in my fingers, I feverishly set to work, using my coat belt and a piece of old strapping I had in my pocket, to lash myself to the upright float support.

The sea was angry. Each great wave subsequently racked my very being with the thought of what destruction might be done next. Many times my feet were forced from the float and I was suspended knee-deep in the water. What a mercy I was tied on! It became necessary to twine my legs round the float support at the approach of each big wave.

I had no idea of time passing. I was too occupied, but I learnt afterwards that I had only been stranded for three hours or so. The physical fatigue was so intense, so racking to every nerve and sinew of my body that at times

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it deadened even the mental torture I was enduring.

Many people have been drowned, or have been rescued at the last minute after hours of drifting. They have all known what this sort of suspense is, hanging on to the last straw as it were, with the knowledge that one might soon be dead.

Above all, being stranded alone in a predicament like this, my loneliness in itself was agony. This is an experience which stands out throughout one's life. Its impressiveness causes one to live through it again and again in succeeding years.

It is impossible to see very far when floating on the level of the water and the only opportunity to get a peep at a distance was when I rode on the crest of a wave. Although this was happening to me very frequently, it gave me no time to look for long.

At last, when I had almost abandoned hope, I thought I saw some object. It was so vague that I thought it might only be a mirage, but to my great relief, I could make out some smoke on the horizon.

I was so exhausted that I do not know how I found power to pull the trigger and discharge one of my last two distress rockets. It was as if some super force aroused and aided me to put up a hard fight. Even then, I dared not hope that my signal had been seen.

At times, I completely lost sight of the vessel, but with the few intermittent glimpses I got, it appeared to be stationary.

It took me a long time to make up my mind to fire my last Very light. What if they should not see it? I waited and then, summoning all my strength, I chanced it, not daring to look again for God knows how long in case it had not been seen.

Shortly afterwards, I realized that a boat manned by sailors was coming to my rescue, carrying out the hustling orders of the commander who was shouting to them through a megaphone, from a destroyer.

The only words I could utter were to beg them to save the aircraft, which they did. There appeared to be such need for hurry that the machine was being secured whilst the destroyer proceeded on its way. Meanwhile, I was being revived with brandy and given dry clothing.

The commander afterwards told me that they had seen my last signal and thinking that I had been shot down by a U-boat, they had, before rescuing me, dropped depth charges all around the machine. His reason for pushing off so hurriedly once they got me on board was because of the danger of being torpedoed. They knew there was reason to be wary, for they were searching the same area that I had been sent out to search. They had not, however, sighted anything for hours until they picked me up.

They also informed me that while I had been resting, a Short seaplane with pilot and observer had flown over them obviously noticing my machine suspended on the side of the boat and had signalled the code enquiry, "Have you pilot Merriam on board? "—to which they replied accordingly.

They were a grand crowd of officers and men on that destroyer and I shall ever be indebted to them. They did everything possible for my restoration and comfort.

I cared not for submarines, nor for the collision we nearly had with another boat when going full steam in the darkness, nor for anything else that could happen. The joy of company, after my nightmare of loneliness, was all that mattered to me then, despite my bruised and battered limbs.

The destroyer was not due back at her base until late, but in view of my being on board, the Commander decided to put in earlier than the scheduled time.

When nearing our destination a message that we wished to enter was signalled. When asked to give the code, it was discovered that through some extraordinary misfortune or misunderstanding, this had been forgotten, and we were ordered to retreat immediately, otherwise we should be fired upon.

This caused us to put to sea again for another hour, when the commander thought he would have another try at entering, though still not remembering the code.

This time we were successful, but only because he could furnish proper information about me, which tallied with the particulars of my identity as given from the air station. We were ordered to enter at lowest speed, however.

We got in at 10.30 p.m. and I had been away from my base nearly twelve hours. By the grace of God and the help of the British Navy, I live to tell this tale!

Rather than improvement in the reliability of aircraft and especially the engines, as we might have expected after the third year of the war, it was becoming worse. The engine defectiveness was no doubt due to the rapid and pressing demand to standardize them for instant service.

Pulford told me that when he had formed and trained the first Torpedo Squadron in 1918, which was intended to attack the German High Seas Fleet, it was as well that the attack was

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never launched (owing to the surrender of the German Fleet) because our aircraft were equipped with Sunbeam Arab engines, which were most unreliable, although they gave a lot of horse-power for their weight.

During this time we were getting unlimited trouble with seaplanes and flying boats and it was no wonder the pilots had wind up about going on long sea patrols.

The following letter, dated 28th October, 1917, came from an old pioneer flying friend, Marcus Manton, and shows that he was up against the same difficulties then:

"I have been having a lot of trouble with engines, etc., lately—in fact, this month's output includes three 'duds' which I am absolutely sick of flying as they have no ginger and won't climb."

At the time of writing to me, Manton was testing for Samuel Whites Ltd., of Cowes. When a pilot like Manton complained about anything in those days, one can reckon there was good reason supporting it, for he was one of the foremost experimental test pilots of this country during the war.

On one trip with a Sub-Lieut. Lane, who was having an instructional course, we were stranded around the coast near Torquay with engine trouble again. In due course a motor launch came to tow us to Dartmouth, where H.M.S. *Reveria*, the seaplane carrier, was moored. We remained the night on board while adjustments to the engine were made.

Next morning, a thick mist obscured the cliffs and as a result, on taking off, I narrowly escaped flying into them, banking only just in time to avoid a collision. Many pilots have met with fatal accidents in this way. When flying low near a rugged coast such as Devon or Cornwall, the appearance of the cliffs in misty conditions is very deceptive. The damp mist seems to cling and forms a thick curtain before them, merging them into drab-looking clouds.

My next move was to Mullion R.N.A.S. Station for a short spell of photography work, namely, coastal mapping. The machines for the purpose were landplanes, 110/130 h.p. Sopwith "1½-Strutters," equipped with photographic apparatus. This type was one of the first two-seater fighter machines to be produced. The name, "1½-Strutter," was derived from the unusual centre-section struts which gave it the appearance of having one-and-a-half interplane struts.

Flying at 10,000 feet we photographed the Cornish coast to make certain that our fortifications were camouflaged from view of enemy aircraft.

Apart from the machines used for this job, all other aircraft at Mullion were small airships, commonly known then as "Blimps." They certainly did splendid anti-submarine work, but they were only fine-weather craft owing to low horse-power. They were constructionally "mongrels"; in short, they were no more than a wingless body of an aeroplane, complete with propeller and engine, suspended from a sausage-shaped gasbag.

Airships held little interest for me although, incidentally, I had been up in a kite balloon at Cattewater where they were employed for observation purposes, and attached to destroyers by means of lengthy cables. It was a comical sight to watch them from above.

The airship, however, had one important advantage over the heavier-than-air machines in that it could remain in the air for a considerable time and wireless communication could be maintained with liners, independent of motor power, which would enable the engineers to give perfect attention to the engines, and if necessary, overhaul the whole of the machinery, whereas the heavier-than-air craft would be forced down.

It was not surprising to me to discover that the heavier-than-air craft were unpopular with the airship pilots, although a number of the officers at Mullion expressed a wish to fly with me, and did. Moreover, I gave one or two a lesson or so. There were several R.N.V.R. and American officers there connected with the technical side of airships, who took advantage of a spot of tuition with me.

On returning from one of my flights I found that a sea mist had rapidly gathered over the air station and its surroundings. I came down to roughly 50 feet in an endeavour to pick out some of the landmarks. At this height I could faintly see the outline of the huge airship hangar, but although I knew the position of the wireless masts, they were invisible.

After circling around once or twice at this low altitude I was so frightened that I should strike these unseen objects if I landed there that I retreated inland. By this time, the mist had spread still more widely and eventually, I came down in a very small field near Falmouth, slightly damaging one wing tip.

This reminds me of one of my Chingford pupils, Flight Commander E. A. de Vile, who had an amazing escape when he literally perched his machine on one of the very tall wireless masts at Portsmouth, while flying in a mist. There he remained until a bluejacket climbed to his assistance. His, certainly, was an experience of which few, if any, can boast.

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During my stay at Mullion, at my own request and expense, I billeted at Hills Lizard Hotel, chiefly for quiet, as I was still troubled with sleeplessness, and for the reason of exercise which it imposed, walking to and from the air station—about two miles each way.

I was really feeling very run down and in consequence, I most reluctantly gave in, realizing that it necessitated a medical board. This eventually took place at Leamington Spa. The doctors there were aware of my prolonged air work and were generally sympathetic towards me, ordering indefinite leave until I felt fit to resume duty again. I was well off indeed.

After a few weeks I felt refreshed, then following another successful medical board at Leamington, I asked to be sent to France, but instead was posted as second-in-command to No. 250 Squadron at Padstow, an anti-submarine air station.

Solely land machines were used there—D.H.6's and 9's, and 90 h.p. Curtisses. Their engines were much more reliable for sea patrols than were the seaplanes' and much quicker for taking off and housing.

This station was a beehive. At the time of my appointment there the R.N.A.S. and the R.F.C. had been amalgamated, becoming henceforward the Royal Air Force.

Our Commanding Officer, Major R. E. Orton, was an Army flying officer and one of the best to get on with. This was indeed fortunate as there was a good deal of unpleasantness between the two Services. The sudden clashing of the different tactics causes one to wonder at the good result of this important transformation during such a critical time.

I was again as busy as ever on testing and patrols—the latter of short duration—experimenting in carrying heavy bombs with an observer, executive work and flying instruction. The latter was not compulsory, but we had a number of young R.F.C. officers with little flying experience and most of them were rather bad on landings. With mutual congeniality, I set to work improving them, otherwise we should have probably incurred a bad name for crashes.

It often fell to my lot to go out on emergency patrols and I always took an observer with me. Not so very long after Germany had begun her unrestricted U-boat campaign, she was forced to realize her defeat and compelled to draw in her horns a bit; nevertheless, although the menace had subsided considerably, we were being persistently pestered by these unwelcome visitors.

According to my diary notes, we had various visitors to Padstow, whose names are associated with pre-war aviation.

The late Air Vice-Marshal F. V. Holt flew over to inspect the station. It was our first meeting after a lapse of six years, when I had taught him to fly in 1912. His visit was brief but our reunion was pleasurable and to me momentous for, as it turned out, it was the last time I was ever to see him.

Colonel J. T. Babington, D.S.O., who was flying in 1912, also flew in, or rather "dropped" in, for his visit was imposed by engine trouble when flying on a cross-country. We had not met since the early days when I used to test machines at Eastchurch.

During a period that I was acting Commanding Officer, General Mark Kerr, who was taught to fly in Greece by my own instructor and friend, Collyns Pizey, arrived by car to inspect our squadron, and was very complimentary regarding the good appearance of officers and men, and of the station in general.

The terrible epidemic of influenza which swept over England and carried off so many people at that time, victimized several of us at Padstow, though fortunately, without fatal results. I was recovering from an attack but was still confined to bed when a message was handed to me from Brigadier-General H. P. Smyth-Osbourne informing me that I had been awarded the Air Force Cross. Being well in the grip of the depression which usually follows 'flu, the good news was naturally the best tonic I could have.

A rumour went round our squadron that we were likely to be moved overseas shortly, so the C.O., Major Orton, at once submitted my name for promotion in the likelihood of my succeeding him, as he was putting in for a move elsewhere.

I must confess that I was far from hopeful, but the signing of the Armistice decided it anyway and put an end to all further promotion. The war was over and that was all we cared. It was such a joyful time as everybody knows, and needs no further comment from me except to say that it meant parting from some good comrades, for I transferred almost at once to the 29th Training Squadron, Croydon.

There, I was back at my old job of instructing, and my pupils were released prisoners of war. I remained at it until demobilized on 28th May, 1919.

(Concluded)

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DISABLED AIRMAN

by Flight Lieutenant Michael Nisbet, R.A.F. (Retired)

Never again will I fly high
In the huge wind between the low wind
And the vast space where there is no wind.
The sky like a purple dome around me,
Shot with the setting sun.
And I'll not sit calculating
In the sour cold wrapped in misery,
With pain at my joints and my lips cracked,
How to figure correctly the course
That will lead my crew to an ending
If I calculate wrongly.
I need never more hear the dreadful shout
Of "Tally Ho! Tally Ho! Three one-one-ohs!"
Or feel the blood chill as the fighters close
With the sudden sick certainty of impending disaster
While your aircraft shudders as her guns chatter.
The spade grips and the thumb trips
Of a shuddering Browning, the red tracer curling,
Need have no meaning for me:
Terror and I will walk apart.

And I will not climb up
Through the sodden rain of dark December
To burst in ecstasy through the last film
Of cloud into the sunlight of a new day
In a cleaner, brighter world; nor rush headlong
Over the shimmering plains of stratus,
White in the hard sunlight, swirling in my wake.
I'll never more love England with that love
I gave her on a clear sweet summer's day,
When eight miles high, I glimpsed at once
The coasts of York and Lancaster
And all her tended patchwork in between;
Nor will they pay me now to fly
Over the snow-clad Pyrenees, the gold
Glancing from the peaks, valleys blue-shadowed;
Or send me to Olympus, there to gaze
On Tunis glittering by the sea,
Benghazi, Derna, Sidi B.,
Tobruk, Bardia, a fleet at sea,
Naked beneath my sight and impotent;
Powerless to pluck this monstrous eagle
From its presumptuous height.

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The stars have nought to tell me now;
No more shall I woo them from my crystal dome
High in the night sky, telling their names
In love and reverence: pleading of Vega,
Say, and Spica, to tell me where I am,
Then asking Polaris if they lie.
I will not see the lights of little hamlets
Set in the snow of some Canadian plain,
Friendly and comforting.
Nor peer on shadowed England,
Staring through the darkness fraught with peril,
Estimating, guessing and plotting
'Til a pinprick of light winks on the horizon
Beckoning to the long-sought flare path.

The shouting quiet when the engines stop,
Home in dispersal, respite won;
To feel the earth again, sweet smelling, solid:
To see the glowing faces of your crew,
Your friends, and so much more than friends,
As men will be who've ventured out, dared much,
And yet returned.
The warmth and comfort of the briefing room,
Hot coffee, thick white sandwiches;
And voices pitched and raised
Higher and higher as the nerves react.
Cool wind in the dawning, cool sheets in the morning,
I must remember;
I must engrave the gay excitement,
Scar the wild thrill, the horror
On my mind. I must remember
That I used to fly,
Though glory and I be now estranged.

November, 1942.

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REMINISCENCES

I—THE FIRST AEROPLANES AT HALTON

by Wing Commander D. L. Allen
R.A.F. (Retired)

OF the many thousands of officers, airmen and aircraft apprentices who have passed through the Royal Air Force Station, Halton, it is improbable that more than a handful know the story of how the first aeroplanes came there. To the old hands of No. 3 Squadron, R.F.C., now long on the retired list, the story will recall the pleasantest memories, whilst the modern generation will perhaps appreciate that the old-time Service life had its compensations when it experienced hospitality the like of which will never again be seen in this country.

The story begins when Major Brooke-Popham, commanding No. 3 Squadron, R.F.C., and his adjutant were prospecting the area to the north of the Chilterns for a landing-ground for their unit during the opening phase of the 1913 Army Manœuvres. This was Rothschild country, and that great family had determined to show H.M.'s Forces hospitality worthy of their house. So when the officers, one June morning, called on Mr. Alfred Rothschild at Halton House their reception was most cordial. Mr. Alfred was entertaining the whole of the First Guards' Brigade in his park during the rest period between the Inter-Divisional Exercises and the Army Manœuvres. Of course, he must insist that No. 3 Squadron should likewise consider themselves his guests, and steps would be taken to provide a landing-ground or anything else needed. The matter was settled there and then, for the Rothschilds were as kings in their own country, and royalty must not be denied. The area now covered by the parade ground and buildings of the South Camp was in due course prepared as a landing-ground, and it was arranged that an advance party should arrive a week beforehand to erect the recently evolved portable aircraft hangars and pitch camp. When the adjutant arrived on a fine mid-September afternoon, he found awaiting him an invitation to stay at Halton House. Mr. Rothschild accepted his plea that he should sleep in camp, but insisted that he should have all his meals at the house. Never was a young man more lavishly entertained. He had but to drop a chance remark that he was interested in horses, and a horse was provided for him to ride between the house and the camp. A discussion on opera resulted in the arrival from London of a section of the Covent Garden Orchestra, on whose services Mr. Rothschild used to have a lien. And then there was the private circus, which provided an amazing variety of turns. In the meantime, a tented city was arising in the area now occupied by Station Headquarters and the technical buildings of the North Camp. Vast marquees were erected to accommodate officers' and sergeants' messes, soldiers' mess tents and canteens. Stocks of food and drink were accumulated, ante-rooms furnished with carpets, sofas and easy chairs; electricians installed lighting, and the estate gardeners laid out flower beds and decorated the tents with pot plants. Everything was in the best of taste, for the camp and the aerodrome had temporarily become matters of absorbing interest to Mr. Alfred, who in his spare time settled an international loan and one or two matters of high finance.

The Guards marched in hot and thirsty, and it was not long before all ranks were doing full justice to the generous fare offered by their host. Generous it was, and for the whole of the rest period. In the men's messes all meals were on a most lavish scale, beer measured by the quart and cigarettes by boxes of fifty, whilst the sergeants were well found in beer, whisky and cigars. In the Officers' Mess, catering was on a Ritz-Carlton standard with champagnes, clarets, hocks, Burgundies; and all the other components of a wel-stocked cellar pressed upon the not-unwilling officers of the Brigade.

For the countryside the main excitement was the arrival of the aircraft which landed successfully, despite the limited dimensions of the alighting area. By car, by every variety of horse-drawn vehicle, on wheel and on foot, the whole population of Buckinghamshire seemed to converge on Halton. The gamekeepers of the estate aided the local police to control entry to the aerodrome, and before nightfall many thousands had had their first close-up view of an aeroplane. As ever, whilst others rested, the "Air Mechanics" were at their busiest, for there were dihedrals to check, obturator rings to change, and all the other intricacies of the aircraft servicing technique of a bygone age.

As a red sun set behind the Chilterns all was activity and hustle at the big house, for Mr. Alfred was entertaining to dinner the whole of the officers of the First Guards' Brigade and of No. 3 Squadron of the Royal Flying Corps. At the aerodrome, covers were being laced over engines and fuselages, screw pickets and lashings were being secured, and the aircraft bedded down for their first night at Halton.

And so in a convivial atmosphere of good food and wine the first aeroplanes came to Halton.

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Battle of Britain Memorial

His Majesty the King has graciously consented to unveil the Battle of Britain Chapel in Westminster Abbey at noon on Thursday, 10th July, 1947.

The next-of-kin of aircrew of R.A.F. Commands and the Fleet Air Arm who are known to have lost their lives in the Battle (between 10th July and 31st October, 1940) are invited to submit written applications without delay for tickets to enable them to attend the ceremony.

When submitting applications, next-of-kin are requested to state their relationship and the number, rank, full names and squadron of the aircrew in respect of whom application is made.

As the space is limited, the number of tickets it will be possible to issue to any applicant will depend on the number of applications received.

All applications and enquiries should be addressed to Air Ministry (S.4 (f)), King Charles Street, Whitehall, S.W.1. No application should be made to the Abbey authorities.

Army, Navy, Marines and Air Force Provident Society

The above-mentioned Society was established in 1889 to provide annuities for the widows (or orphan children) of its members. Royal Air Force officers were admitted towards the end of the last war, and originally had to be 30 years of age or over. Recently this rule about a minimum age limit for the R.A.F. was abolished.

Officers holding permanent commissions in the Royal Navy, Army, Royal Marines, Royal Air Force and Royal Indian Navy are eligible for membership provided they are under 50 years of age.

Under the present rules an officer may take up either one, two, three or four memberships, and an annuity of £2 10s. for each membership (£10 for four memberships) is payable when the membership has been held for six years. The annuity increases after each subsequent year up to a maximum of £13 for each membership (£52 for four memberships). If death takes place before the membership has been held for six years the contributions are refunded to the widow or orphan children. The annual contribution for each membership is £2 plus a disparity fee of 2s. 6d. for each year the wife is younger than the member.

Full particulars and form of application can be obtained from THE SECRETARY, "BURNSIDE," YATELEY, CAMBERLEY, SURREY.

FALSE GODS

by W. G. Sheppard

2.—CHINSTRAP ON NEWTON

MY recent article on Copernicus has brought me a most interesting letter from Colonel Chinstrap. Many of the Colonel's admirers will no doubt be surprised to learn that he has ever heard of Copernicus or of Newton (who appears to be something of a *bête noir*). I must confess that I had myself taken it for granted that he passed out from Sandhurst whereas, he informs me, the relevant entry in his service documents reads "Failed Woolwich."

The letter has a superficial appearance of incoherence but, knowing the fundamental sanity and lucidity of that possibly one-track mind, I have been at some pains to extract the wheat from the chaff and, where necessary, to decipher those words which are partly obscured by a series of circular brown stains.

He begins by congratulating me on my courage in questioning the conclusions of Copernicus ("These science wallahs, sir, are too damned sure of themselves"), but maintains that I have myself fallen into certain errors. The earth rotates all right: he has himself at times felt it rotating about two different axes simultaneously. And there is something queer about the relative motion of the earth and the sun (and still more of the earth and the moon). He does not ascribe it to the one more than to the other: as he says, he "would not put it past either of them."

Chinstrap is nothing if not a constructive critic, however. He offers two epoch-making suggestions, basing them on evidence which I can confirm from my own independent observation. These are:

(*a*) That any satisfactory explanation of natural phenomena must include a time factor. As he so rightly points out, the behaviour of things at 2 a.m. is quite different from their behaviour at, say, 11 a.m.

(*b*) That progress in physical science will only come through a study of the psychology of so-called "inanimate" things. He points out that he is by no means the first to observe the essential depravity, or inherent "cussedness," of inanimate objects, and we must therefore try to learn something of what is at the back of their minds before we formulate any so-called natural laws.

I have myself been called an iconoclast, but I must confess that the Colonel has shaken me on the subject of Newton, whom I had previously

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been prepared to swallow whole. He accepts the Newtonian theory of universal gravitation qualitatively, but stoutly denies the quantitative law. He is himself, he claims, abnormally sensitive to gravitation. Most people cannot even feel the pull of an ordinary brick wall, but it seriously deflects him from a straight course. The effect is particularly noticeable after closing time.

It is Newton's laws of motion, however, which most rouse his ire. He instances this same brick wall. On two successive nights he struck it a light glancing blow: on the first night the reaction was negligible, whereas on the second night the wall savagely assaulted him. As he cogently remarks: "Action and reaction may have been equal and opposite on one occasion, but they could not possibly have been equal and opposite on *both* occasions."

He is particularly bitter about the alleged law that the acceleration of a body is proportional to the impressed force. It appears that he has to negotiate a rug in order to get into bed, and while it is quite docile some nights when he steps on it, at other times it retreats with almost incredible acceleration. My own experience tends to confirm Chinstrap's, but I think he perhaps exaggerates a little in suggesting that the rug attains a velocity approaching that of light. Again, he is a little unfair to Newton in ascribing to him the theory of double refraction, which is in fact due to Huyghens. He maintains that a crystalline medium is not essential to the formation of two images; that quite often in the local he sees two of everything when the only refracting medium is a somewhat thick atmosphere. He knows that this is a case of double refraction because *as the bar rotates* one image remains stationary while the other describes a circle!

Although, as noted above, Chinstrap has himself suggested the most promising line of investigation for bringing some sort of law and order into a seemingly erratic universe, he obviously is not optimistic as to the probable outcome. In a postscript he mentions with glee that he has just heard that atomic physicists have had to introduce a new "Principle of Uncertainty"; and it is clear that he feels intuitively that there is no foretelling what tricks things will get up to next.

I expect that most of the Colonel's followers will be as surprised as I was to find that he is something of a poet as well as a man of science. At first I was puzzled by his many references to the Victorian poets, particularly Tennyson, and was inclined to dismiss them as irrelevancies. On closer study, however, I found that they all had some bearing on his two real articles of faith and his one injunction. His creed may be briefly summarized thus:

(*a*) We shall all ultimately have to cross the bar.

(*b*) Until then every bar will exert its gravitational pull.

And his injunction? "Let there be no moaning at the bar."

He inveighs against what he describes as "the apotheosis of Newton, the false god"—I doubt if he would risk trying to say it—and invites me to make Newton number two on my list. I have done so, but have allowed him to make his own case.

He further invites me to discuss these matters with him in the only atmosphere where complexes cease from troubling and inhibitions are no more. And frankly, "I don't mind if I do."

Book Review

"Diplomacy by Conference. Studies in Public Affairs, 1920-1946." By the Rt. Hon. Lord Hankey, G.C.B., G.C.M.G., G.C.V.O., F.R.S. (Ernest Benn, Ltd, 12s. 6d.)

This is a book for Staff College students. It consists of a series of lectures delivered by the author at various times between 1920 and 1945 before the Royal Institute of International Affairs and other societies.

For three decades, Lord Hankey has filled with distinction important Government posts in Whitehall, as Clerk to the Privy Council, as Secretary of the Cabinet and of the Committee of Imperial Defence and as a member of the War Cabinet. He is therefore well qualified to speak and write upon the working of the machinery whereby imperial and foreign diplomacy is conducted.

It is a characteristic of the present century that international diplomacy is now conducted more by conferences between Prime Ministers and other heads of States, and Foreign Ministers, than was customary during the nineteenth and former centuries, though such methods are by no means new, nor have they rendered the work of the Diplomatic Service unnecessary.

As his title suggests, Lord Hankey is a convinced champion of diplomacy by conference. He advocates it over and over again and seems perhaps a little blind to its disadvantages. He is certainly no impartial critic, but his advocacy deserves the most serious consideration, both for its intrinsic merit and because of the vast experience of the advocate.

These lectures will be particularly valuable to Staff College students for two reasons: first, because they throw much light on the way in which international differences are thrashed out and settled (if only temporarily) and how wars are averted—and caused; and second, because the book deals not only with international relations but also with relations between the United Kingdom and the self-governing Dominions of the British Crown.

Lord Hankey's lectures cover a variety of topics: Government Machinery, The Cabinet Secretariat, The Committee of Imperial Defence, Disarmament, International Forces, The Dominions and the War, The Empire in the Future and External Affairs; and through them all, like a silver thread, runs the author's predilection for Diplomacy by Conference.

Lord Hankey's treatment of these topics is informed, penetrating and subjective. Like a sympathetic guide, he takes his reader behind the scenes of international politics and, with a running commentary at once informative and entertaining, shows him the forces, personal and impersonal, that have shaped the destinies of nations during the past thirty years.

R. F. P.

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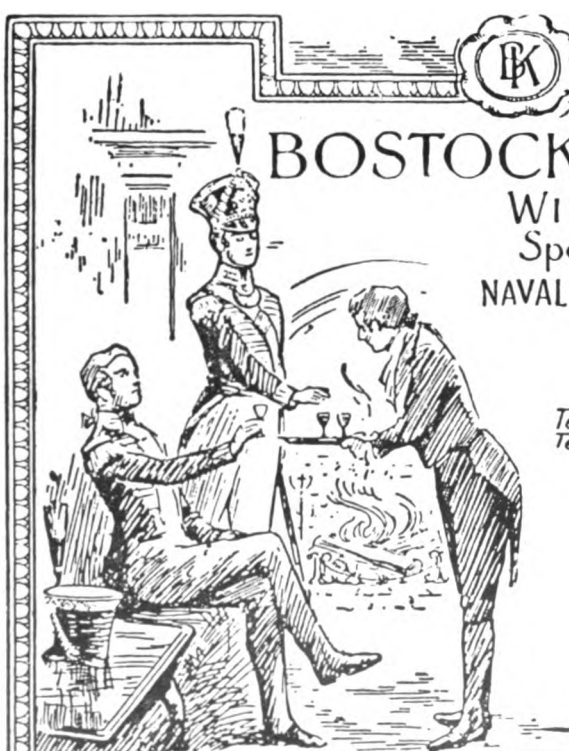

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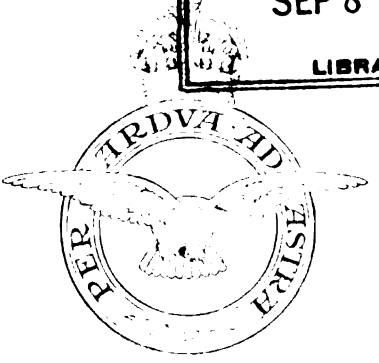

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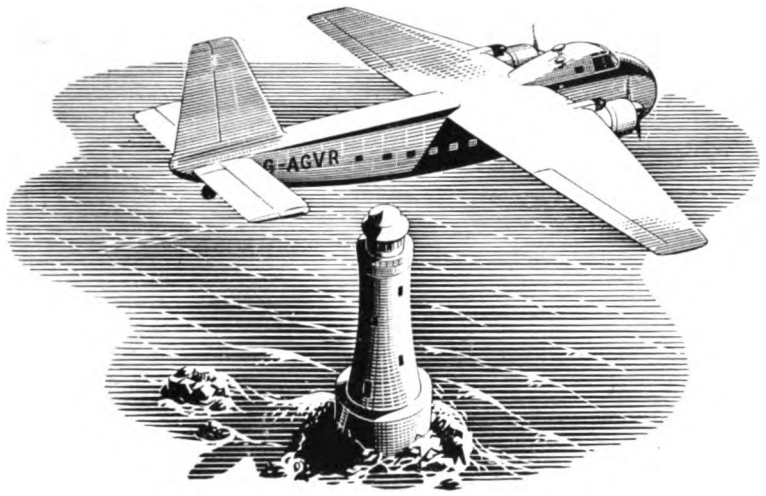

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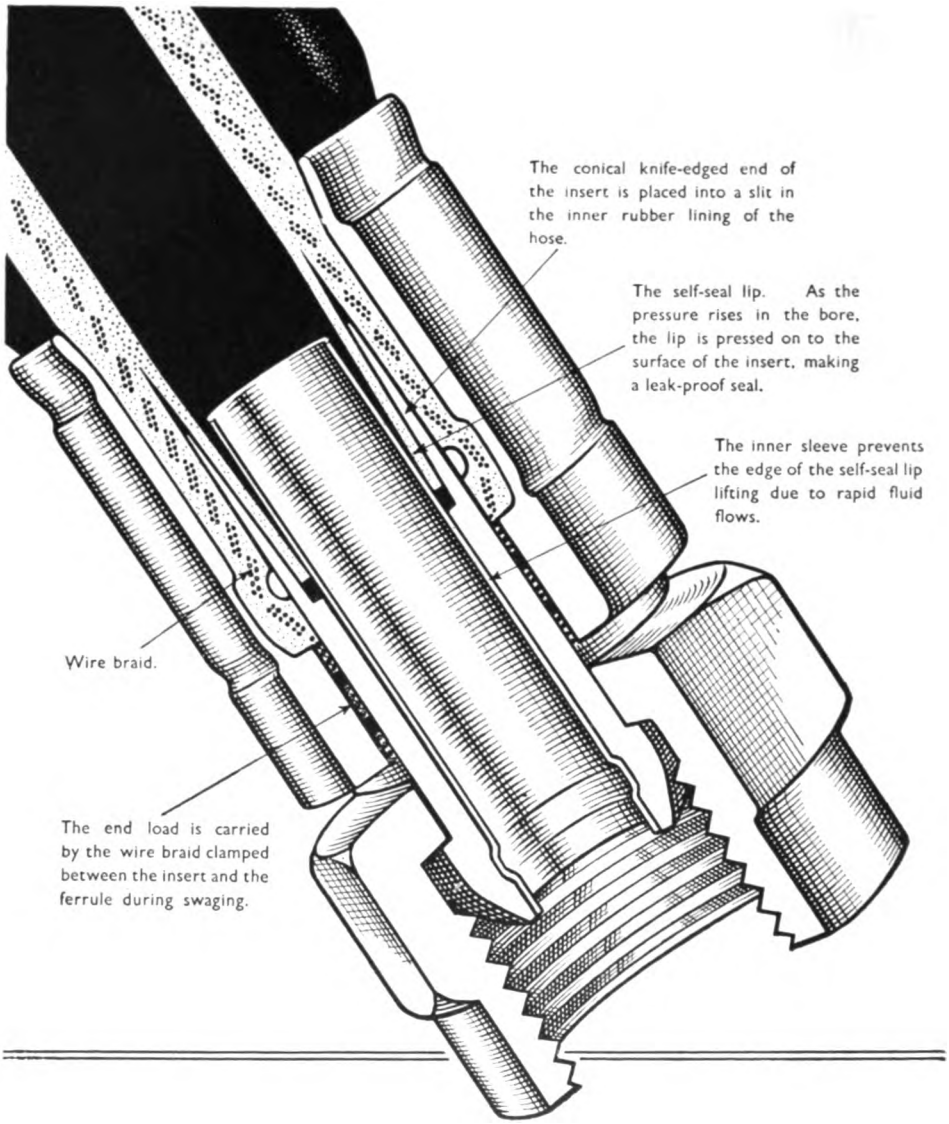
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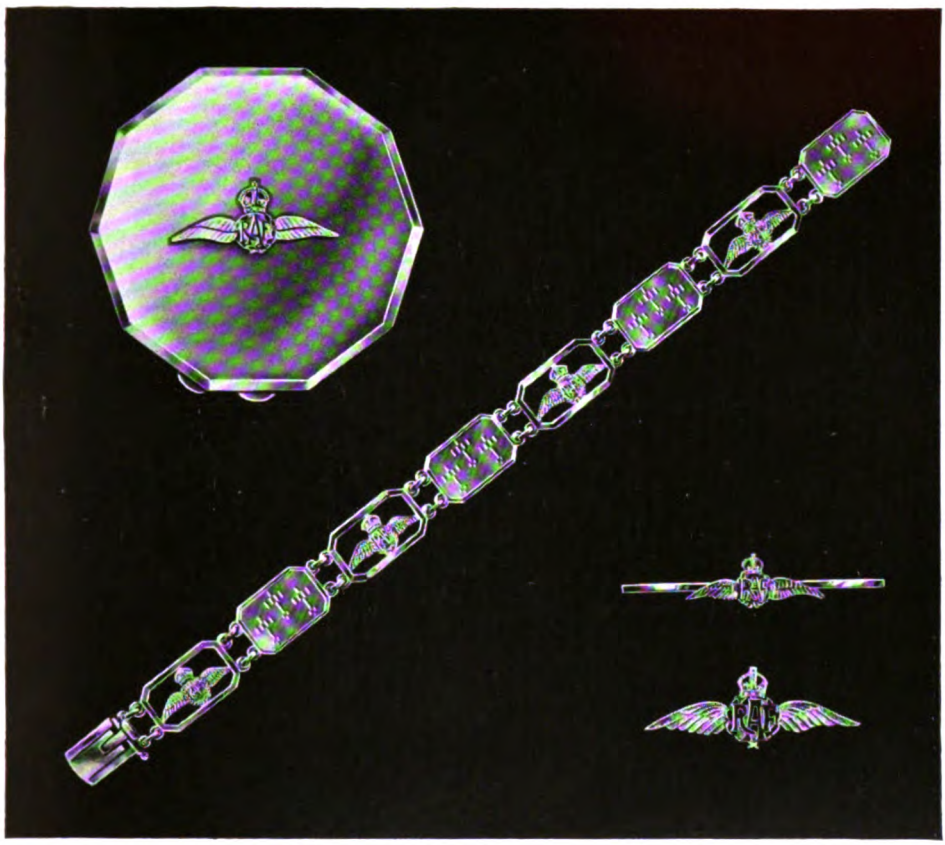

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EDITORIAL

World Affairs

I.—PEEP BEHIND THE IRON CURTAIN

LORD HANKEY, whose book, "Diplomacy by Conference," was reviewed in the March Number of this Journal, contributed a revealing article to the *Sunday Times* on 27th April, 1947.

"In every country," he begins, "people are asking why the Russians, who were such wonderful allies in the war, are not co-operating better in peace." And he finds the answer to this question in Stalin's book, "Problems of Leninism," which was republished in Moscow in 1945. "This work," he says, "has been described as Stalin's 'Mein Kampf,' and, as the Nuremberg Judgment said of Hitler's prototype, its importance 'lies in the unmistakable attitude of aggression revealed throughout its pages' but with this difference, that Stalin's aggression is ideological rather than military."

The book tells the whole story of the Russian Revolution. The author divides the history of the revolution into three phases: (i) the overthrow of Tsarism, (ii) the establishment of the Communist Dictatorship, and (iii) the consolidation of the new regime and its development *as a base for the overthrow of imperialism in all countries.* The last phase, according to Stalin, is still unfinished. Here, it appears, Stalin goes farther than Lenin. Where Lenin wrote "the victory of the *Revolution in at least several countries* is needed," Stalin writes *"in all countries."*

Much strife is contemplated by Stalin, including civil wars and external conflicts. Karl Marx himself forecast these and suggested they might last for "fifteen, twenty, fifty years." The bourgeoisie (? middle classes) are regarded with disfavour and the overthrow of their power and its replacement by the power of the proletariat is aimed at; but the main enemies are clearly imperialism and capitalism.

Stalin wrote in 1927: "Having sown the seeds of revolution both in the centre of imperialism as well as in its rear, having weakened the might of imperialism in the mother countries and having shaken its domination in the colonies, the October Revolution has thereby jeopardized the very existence of world capitalism as a whole." Lord Hankey points out that, although these claims were completely refuted by war experience, they provide a useful warning.

Stalin is a true bolshevik, which word, we believe, is best translated into colloquial English by the phrase "one who goes the whole hog" or "a whole-hogger"; as distinct from the menshevik—one who goes only part of the way, or a "half-hogger." he has no time or use for Social-Democrats, those "labour lieutenants of the capitalist class"as Lenin called them and he says: "It is impossible to put an end to capitalism without putting an end to Social-Democratism in the labour movement." For him only the blood-red banner of the Communist Revolution: he will have none of the pale apologetic pink of certain socialist politicians.

For Stalin, the end justifies the means; and treaties are made only to be torn up when they have served *his* purpose. (One is reminded of the so-called "scrap of paper" which guaranteed the neutrality of Belgium in the early part of this century and which the United Kingdom refused to tear up at the scornful suggestion of the German Ambassador in 1914.) He instances the non-aggression pacts which he formed with Finland, Poland and Rumania. "The object of these treaties," writes Lord Hankey, "was to gain time, and they were callously broken when convenient." They were merely "tactical deviations" as was also his agreement with Hitler of August, 1939, which "gave Russia the Baltic States and half of Poland." (Hitler, of course, knew this, and it was his justification for invading Russia in 1941.)

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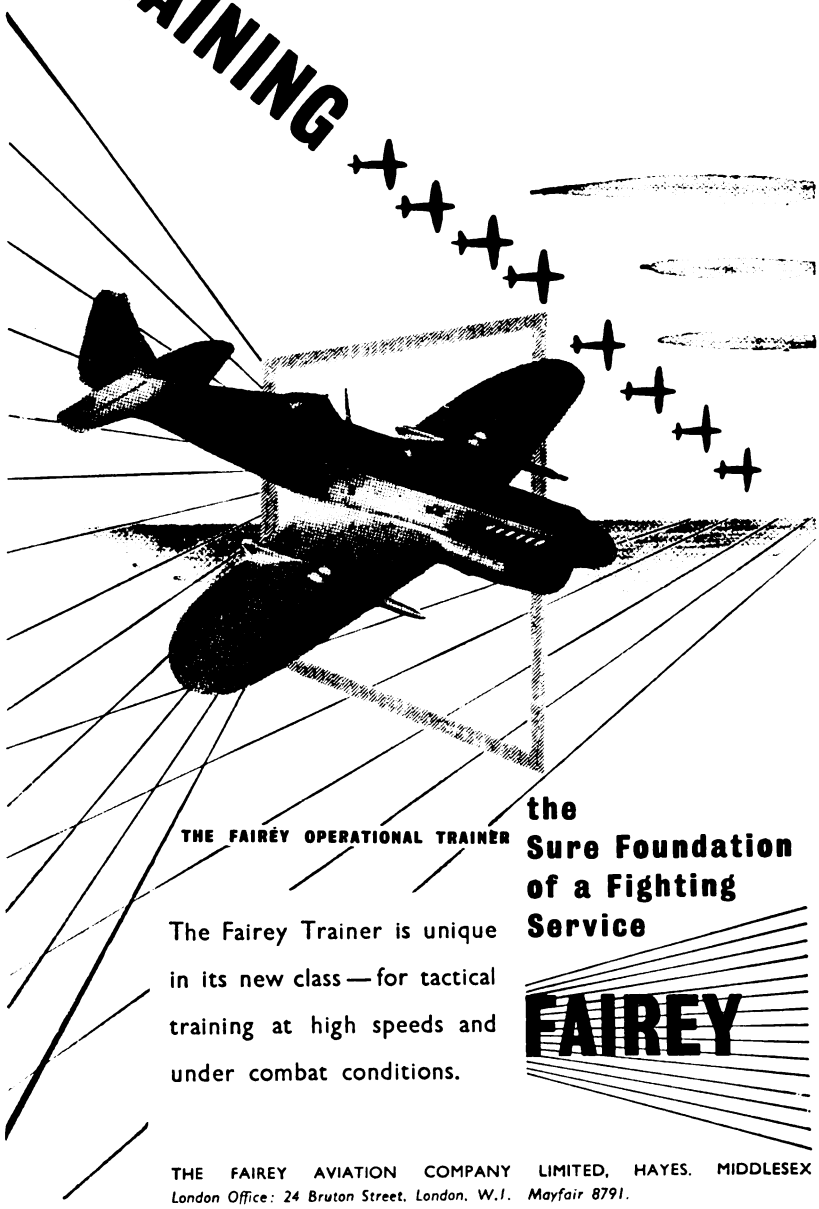

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Lord Hankey rightly suggests that his "brief summary shows why co-operation with Russia is difficult," and he concludes with the following warning:

"The Russian domination of Eastern Europe and the installation of Communist Governments are consistent with Lenin's insistence on 'the victory of the revolution in at least several countries.' The attempt to hem in Turkey from east and west, linked with the reopening of the question of the Straits, although followed by a tactical retreat in Persia with prospects of another in Greece, suggest that revolution ' in all countries ' is still in the programme. So, even more, do the Communist activities in Albania, Italy, France, Spain and Germany.

"For the moment the risk of war is rendered slight by economic exhaustion. But on a long view the situation is dangerous; for ideological aggression, if persisted in, will lead to war. **Clearly we must not neglect our armaments.**

"But we must try to disperse the storm clouds. There are deep-rooted Russian suspicions to be dispelled. Then Russia has to be convinced that she has nothing to fear from the so-called 'capitalist' Powers, so long as she leaves other countries alone; but it must be made unmistakably clear that all forms of external aggression will be countered everywhere by deeds as well as words, as in Greece to-day. That will take time, and will need truth, toughness, tact, persistence and patience, all of which qualities Mr. Bevin possesses in abundance."

Lord Hankey's warning is timely and his advice is sound. As we indicate elsewhere in this Editorial, the Russian challenge has already been taken up by America, with British concurrence. The benefit of a policy of appeasement, except to the nation appeased, is very questionable. The outbreak of war in 1939 is surely sufficient to discredit it forever. And now that America has given a lead, all should be well.

II.—THE UNITED NATIONS

(*i*) *International Control of Atomic Energy*

It appears that a deadlock has been reached in the negotiations for establishing international control over the production and use of atomic energy. This was discussed in the House of Lords on Wednesday, 30th April, 1947, on a motion by the Archbishop of York, who emphasized the urgency of the problem.

That some such control is essential for the security of the world against the misuse of this new power is admitted by all concerned. International control, to be effective, must be accompanied by international inspection, which implies a certain sacrifice of national sovereignty. The nature of atomic energy and of the processes by which it is or may be produced are the same whether the energy is to be used productively or destructively, as Lord Addison said in referring to the findings of the Technical Committee which advised the Atomic Energy Commission of the United Nations; so international inspection would have to be extensive and might cover a great part of the whole field of industry. It can be understood that some nations, perhaps all nations, are jealous of their national sovereignty and very reluctant to make the sacrifice entailed in throwing open their factories to international inspection. Russia, in particular, is not at present prepared to sacrifice so much of her national sovereignty as to allow even representatives of an international body to enter her factories and inspect her processes. In point of fact, Mr. Gromyko declared in the Security Council on 5th March, 1947, that Russia would neither resign her right of veto over the proposed international controlling authority nor permit that authority to carry out inspections on Russian soil.

Though the United States is at present the only nation in possession of atomic bombs and the plant for making them, it is certain that other nations will possess both before many years have passed. Agreement on the question of international control will then be even more difficult than it is now. The Russian counter-proposal—to destroy all existing atomic bombs and to outlaw their use—is futile, as Scrutator in the *Sunday Times* of 4th May, 1947, pointed out. "The first" (part of the proposal), he says, "would hit the United States only and elsewhere would encourage the race for the new killing-machine, since everyone in it might start from scratch. As for 'outlawing' atomic warfare, the Kellog Pact 'outlawed' war itself, and we all know what came of that."

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ACHIEVEMENT

"If I were asked to name the things in which British work has been to the fore I would first quote 'Gas Turbines' . . . .

I have good evidence of the standards we have reached in Gas Turbines during the speed record preliminaries. Rolls-Royce Derwent turbo-jets in the Meteors were models of good behaviour."

OLIVER STEWART

ROLLS-ROYCE

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Lord Russell and Lord Lindsay of Birker proposed an international organization for inspection with Russia left out but free to enter when she would. But this would be more likely to antagonize Russia than to induce her co-operation.

Really there is no alternative to international inspection, if the appalling menace of mass destruction is to be removed from the world. It may reasonably be hoped that, after a decent interval, wiser counsels will prevail and reluctant nations will agree to make what is, after all, only a reasonable sacrifice in order to establish their own security as well as that of the rest of the world.

Lord Samuel revealed the kernel of the matter when he said, "In the long run there can be no absolute protection except the abolition of war." And if this would seem to be a counsel of despair, consider the final paragraph of Scrutator's article already referred to above:

"General and secure peace," he writes, "looks at the moment so remote that to advise waiting for it may be thought a counsel of despair. But may not that too be an illusion? What has endangered peace hitherto has been the unresisted landslide of Russian aggrandisement. Once a halt is called—as America has called it over Greece and Turkey—there is a chance of wiser counsels prevailing. The end of appeasement may yet prove the beginning of peace."

(*ii*) *An International Force*

Plans and preparations for the establishment of a "World Police Force" are also held up, it seems, for reasons not similar to those above but emanating from the same source.

The United Nations Military Staff Committee published its first report on 3rd May, 1947. The report shows that the creation of the United Nations International Force is being seriously delayed by disagreements between Russia and the rest of the Big Five. Russia would have this force weakened almost to the point of ineffectiveness by restrictions of size, structure and location.

Acceptance of Russia's conditions would, at the worst, reduce to impotence what was intended to be a decisive influence in world affairs; or, at best, render it effective only against minor powers. It is difficult to understand this policy of the Soviet Union, even if she fears that a powerful international force might be used against herself. However great and powerful that force might be, it could not, under the Charter of the United Nations, be used against one of the Great Powers, because it would be an instrument of the Security Council, and every Great Power has the right to veto any resolution of the Security Council involving action. Russia knows this very well.

Since, then, the international force cannot be used against any Great Power, nor against any other power whom one of the Great Powers chooses to befriend, what need is there to insist on limitations of its effectiveness? Such a force should be designed, in size, organization and location, according to its probable tasks, by the Chiefs of Staff of the Great Powers who alone are competent to decide these matters. They should be advised by the Security Council, in general terms, what sort of action the international force might be called upon to take; and the Chiefs of Staff should then be allowed to design their force accordingly without interference, in matters of technical detail, by the members of the Security Council. Until the procedure for planning, as outlined above, is adopted, and so long as obstruction is offered solely on political grounds, nothing can be expected to materialize.

Commonwealth and Empire Defence

STRENGTH IN DISPERSION

In his memorable speech at the Guildhall on 15th May the King said: " . . . My travels have made two things more clear to me than ever before. One is the strength for peace and good which the Commonwealth and Empire derives from the wide dispersion of its resources—a strength which no political system possesses in equal measure—a strength which we must all do our utmost to enlarge by mutual help for the benefit of all. The other is the value of moral unity and mutual understanding, whereby our widely distributed strength may be as effective in the tasks of peace as in the ordeal of war."

In its leader the following day *The Times* said of this part of the King's speech:

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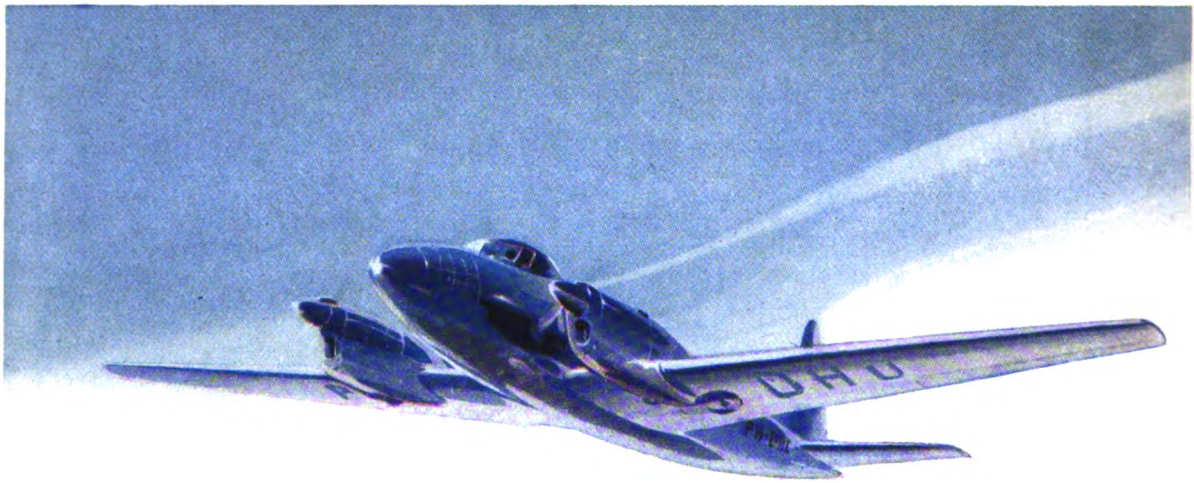

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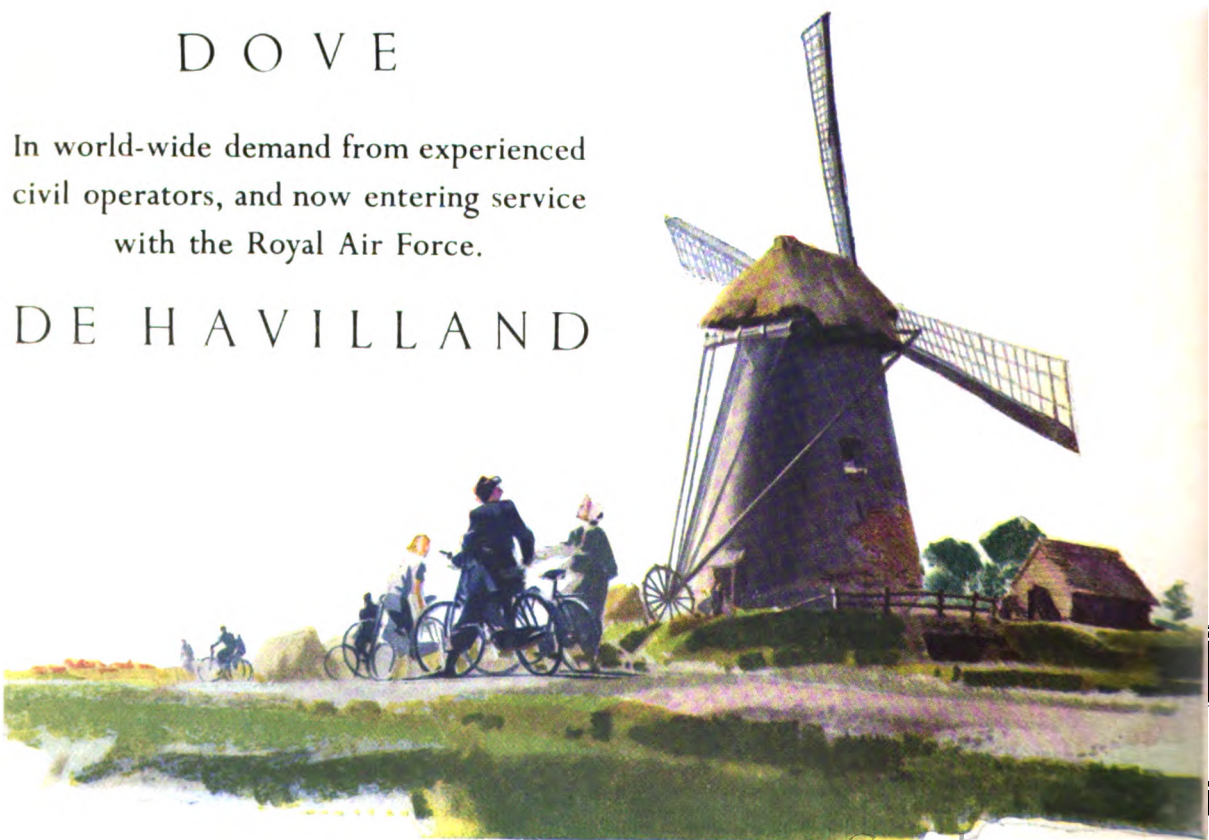

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"In a single sentence the King touched upon what is probably the most important strategic characteristic of the Commonwealth in the world as it stands today, the wide dispersion of its resources. This is a sombre subject, the very mention of which conjures up visions of the perils by which civilization is menaced. One of its few redeeming features is, in the King's words, 'the strength for peace and good which the Commonwealth and Empire derive' from that dispersion, which holds out chances of survival in the blackest eventualities. It is, said the King, 'a strength which we must all do our utmost to enlarge by mutual help for the benefit of all.' The planning and designing of Commonwealth defence is one of the most difficult of all tasks. At the same time it is one of the most worthy and rewarding, since the ideal which it is intended to safeguard is one of the most precious in the modern world. And with that impression of strength in dispersion the King linked the value of moral unity and mutual understanding. This atleast is something which has emerged from the waste and destruction of war undamaged and indeed fortified. A common experience of warfare and a common realization of the urgent needs of the world today have tended to draw the nations of the Commonwealth closer together and to give them an increased sense of partnership."

THE BATTLE OF BRITAIN

Statistics alone prove nothing. In the case of the number of enemy aircraft destroyed in the Battle of Britain it is the least important factor of any. What matters most is the ultimate result. In this case quite enough of the Luftwaffe were shot down or shot up to make the German High Command realize that they could not attain the first essential objective in their plan of invasion—air superiority over south and south-east England—by knocking out or crippling the bulk of R.A.F. Fighter Command. Why did the German Air Force fail?

What can be said to have contributed more than anything else, other than the severity of the casualties inflicted by Fighter Command, was the failure of the German High Command to put first things first in their plan to gain air superiority. If they had concentrated the whole of their air resources upon Fighter Command and its resources from the outset of their onslaught upon this country, and had continued so to do there might have been a somewhat different result.

The fact is the German Army was prevented from invading England because of the failure of the Luftwaffe to achieve its first objective, that of subduing our active air defences to a point where they could no longer effectively defend this country from air attack nor play an effective role against the German invasion forces. This failure of the Luftwaffe to gain its first objective, and its corollary, the calling off by the German High Command of the invasion of England, can fairly and squarely be credited to Fighter Command. To try and prove otherwise is illogical and quite unnecessary.

To return once again to figures. The plain numbers of enemy aircraft destroyed or damaged require to be related to other factors. For example, what was the percentage of losses sustained by the German Fighter and Bomber forces engaged in the Battle of Britain. Surely the German records now available to our Intelligence Staffs provide this information? Taking the figure at *not more* than 2,750 aircraft as the strength of *all the German squadrons actively engaged in the Battle of Britain* at the outset, even these latest German official figures of their losses prove that Fighter Command won a resounding victory and that the losses inflicted were sufficient for the German High Command to realize the futility of continuing the struggle. The percentage loss—destroyed or damaged—on this total figure of 2,750 available at the commencement of the Battle works out at 86 per cent., *i.e.*, from 10th July to 31st October—a period of just less than four months—practically the whole of the original enemy force engaged had been wiped out.

We suggest that unless all the facts properly correlated and placed in their true perspective can be issued it would be far better to refrain from issuing bald statements of losses such as those given in Parliament.

* Figure given in "The German Air Force," by Wing Commander Asher Lee. (Duckworth, 21s. net).

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The Battle of Britain—Abbey Memorial

On 10th July the King is to unveil a remarkable and beautiful war memorial in a chapel in Westminster Abbey. It is to the airmen who died winning the Battle of Britain in 1940. Here is a description of the memorial given in the B.B.C. Home Service News Talk on 23rd May, by a Wing Commander who took part in the Battle.

The memorial is a window in one of the chapels in Westminster Abbey—a window of singular beauty; and it is dedicated to the pilots and other aircrew who lost their lives in the Battle of Britain. The chapel (which itself bears the marks of bomb-blast) is the most easterly of the five small ones which form part of the Henry the Seventh's Chapel, that splendid example of Tudor-Gothic architecture. Part of the window is descriptive of the squadrons which took part in the battle, and contains the badges and flags of many nations that fought side by side in defence of these shores.

The remainder of the window symbolizes the Incarnation, the sacrifice of the mother and the widow of those who lost their lives in the battle, the sacrifice of the pilot himself, the vision of the Resurrection and the pilot's triumph.

Throughout the background of the window a rose-tree grows, the Rose of England, the badge of Henry the Seventh.

In the Chapel is an altar of English walnut with silver furnishings. North of the Chapel is a wrought-iron lectern on which will stand the Roll of Honour. This will be a great book of rare beauty: a book of over a hundred finely illuminated pages bearing the names of the fallen and the whole thing richly bound in blue morocco leather.

The pages of the memorial book contain the names of 1,495 pilots and aircrew killed or mortally wounded during the battle. Of these, 449 came from Fighter Command, 718 from Bomber Command, 280 from Coastal Command, 14 from the other Air Force Commands and 34 from the Fleet Air Arm. The names include 1,298 men from the United Kingdom, India and the Colonies, 47 Canadians, 47 New Zealanders, 35 Poles, 24 Australians, 20 Czechoslovaks, 17 South Africans, 6 Belgians and 1 American.

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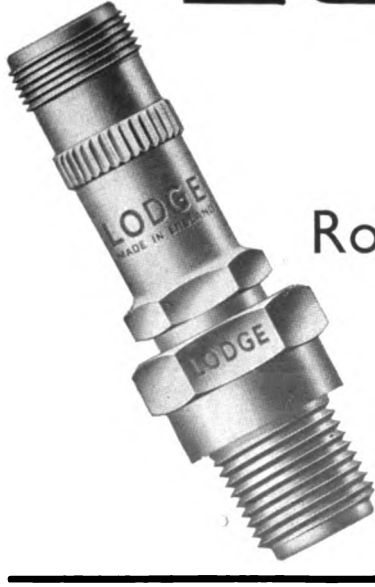

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Assisted by an Advisory Committee of Members of the R.A.F. and Air Forces of the Dominions

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OVER THE SUEZ CANAL

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Strategic Air Bombardment, 1943-45

By J. M. SPAIGHT, C.B., C.B.E.

We are privileged to publish serially a manuscript prepared for publication as a book by the author of "Air Power and War Rights" (a third edition of which has just been published by Longmans). In his new work on strategic air bombardment the author surveys the Allied strategic bombing and the lessons to be learned therefrom.

CHAPTER I

DID AIR POWER DISARM?

THE UNITED STATES STRATEGIC BOMBING SURVEY

THERE is no lack of authoritative information about the effect of the strategic bombing in the war of 1939-45. In November, 1944, the Secretary of War at Washington established the United States Strategic Bombing Survey, pursuant to a directive from President Roosevelt. The chairman of the Survey was Mr. Franklin D'Olier, the vice-chairman Mr. Henry C. Alexander; there were nine directors, a secretary, and a subordinate staff of 650. Its headquarters were in London, with branches in Germany after the invasion of that country. It issued a number of invaluable reports, the most important for the present purpose being the *Summary Report (European War)*, issued on 30th September, 1945, and that on *The Effects of Strategic Bombing on the German War Economy*, issued on 31st October, 1945. As stated in a later chapter, the members of the Survey went on to Japan subsequently and issued further reports on the strategic bombing of that country.

Of the reports relating to Germany, that dealing with economic effects is much longer and more detailed than the other, and is also not as freely available to readers in this country; it is the report of which most use has been made in the present study. It is a coldly dispassionate analysis, fortified by abundant statistics, of the results of the offensive against industrial and other targets in Germany. It seems, indeed, at times to be a little less than fair to the air arm. The compilers of it are certainly not chargeable with any bias in favour of air power or disposition to make a case for it as a war winner. And yet the conclusion of the whole inquiry is that air power decided the war. That conclusion is stated more specifically in the other report, the *Summary*. It says:

"*Allied air power was decisive in the war in Western Europe. Hindsight inevitably suggests that it might have been employed differently or better in some respects. Nevertheless, it was decisive.... Its power and superiority made possible the success of the invasion. It brought the economy which sustained the enemy's armed forces to virtual collapse, although the effects of the collapse had not reached the enemy's front lines when they were overrun by Allied forces.*"

Air power accomplished, in fact, the task which those who believed in it were convinced that it was capable of accomplishing. It disarmed Germany. It did not do so in precisely the way which had been foreseen by the writer. He had envisaged air power reducing an enemy's war economy to a chaotic condition by a frontal attack on production. Actually, it brought about that result more effectively by a kind of flank attack—an attack on the transportation facilities needed for the products of industry. The one way—the freezing of movement—spelled disarmament no less than the other—the freezing of production. The result was what mattered.

OUR WEAKNESS IN 1939

True, it took five years to make its effect felt. That was hardly surprising. The position in which we found ourselves in 1939 was utterly different from that which the writer had contemplated some years before. He had never imagined that this country, which had been the strongest in the air in 1918, would begin the next war in a state of lamentable inferiority to its opponent. The assumption that we should be at least as strong as any likely enemy still seemed to be justified until 1935. It was confirmed by Mr. Baldwin in 1934. "We have been most solemnly promised parity," Mr. Churchill said in the House of Commons on 27th January, 1937. We had not got it then, or two and a half years later, when the war began. We allowed Germany to obtain a lead in the air, and in 1938 we virtually admitted that it was a lead which we could not overhaul. We threw over the aim of parity. That was the grim implication of what Lord Swinton said in the House of Lords on 12th May, 1938. Parity, he said, bluntly, was "a bad term." No wonder the noble Lords gasped. The whole country felt that it had been let down. Three days later Lord Swinton resigned the office of Secretary of State for Air, and Sir Kingsley Wood succeeded him; but the sands were running out fast. The position when the war began was that we did not really possess air power; we had (in our fighter machines at any rate) one

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of the constituent elements of it—quality—but not the other—quantity. We had an air force that was mighty indeed in battle but far too small. Germany was more than three times as strong in the air as we were. It was Goliath on her side, David on ours. That fact alone is sufficient to explain why the views of those who believed in the disarming capabilities of air power seemed to receive no support for so long.

That was, and is, of course, to look at the question from the British angle, which the writer naturally did and does. The Luftwaffe on its side might conceivably have disarmed us *if*—an all-important if—it had been a force designed for strategical and not merely tactical use. Being the kind of force it was it was never really likely to do to us what we and the Americans did in the end to Germany. The Nazis never understood air power.

Our Bombing Effort, 1940-42

It is not astonishing that until 1943 our strategic offensive was a rather feeble effort. We had neither the machines nor the bombs that were needed if mortal injury were to be done to the German war potential. The raids of 1940-42 had little effect. The American Survey states:

"Prior to the summer of 1943 *air raids had no appreciable effect either on German munitions production or on the national output in general. . . . It is impossible to conclude that either submarine production or munitions output as a whole was any smaller as a result of air raids than it would otherwise have been. . . . The effect of air raids became more noticeable from the summer of* 1943 *onwards. This was partly due to the heavier weight of the R.A.F. attacks and partly to the appearance of the A.A.F. in major strength."*

An Air Ministry Bulletin of 10*th June*, 1945, on "The Scope of the Offensive," said *inter alia*:

"In spite of the great successes of 1942, *the further development of navigational aids, and the formation of the Pathfinder Force during that year, it was not until* 1943 *that Bomber Command was sufficiently strong in four-engined aircraft to begin the main offensive against Germany. And it was also in* 1943 *that the U.S.A.A.F. was ready to begin its strategic campaign against targets in Germany."*

Germany's Increased Production, 1943-44

The disturbing fact is that for more than a year after the heavy assault began in 1943 the graph of munitions output in Germany continued to rise. The United States Strategic Bombing Survey states:

"Production of armaments in 1943 *was on the average* 56 *per cent. higher than in* 1942, *and more than twice as high as in* 1941. *The reasons for this remarkable phenomenon are manifold. Foremost among them was the existence of large untapped capacities in Germany's industrial establishment. Machine tools and equipment of all kinds were plentiful. At this stage not even raw materials constituted a limiting factor of production. The volume of output depended almost entirely on the intensity and efficiency of effort. Where necessary, longer hours could be worked, more shifts could be introduced, the existing floor space could be better utilized, methods of production could be improved, and the specifications of finished products simplified. Equally important perhaps was the astonishing ability to absorb air attacks displayed by the German civilian population. Production was sizeable and even on an increasing scale in the cities of the Ruhr Valley, in Berlin, Magdeburg, Hamburg and other heavily bombed communities."*

The increase in 1943 was followed by a still greater one in 1944. The Survey states:

"Despite the damage wrought by air attack and territorial loss, and despite the general drop in production in the second half of 1944, *total industrial output for the year was the highest of the war. In the first seven months of the year munitions production rose sharply, continuing the general upward trend that had persisted since the beginning of the war; in the last five months of* 1944 *it fell almost as rapidly as it had previously risen."*

The fall made Germany's economic position desperate in December; but the fact that the graph of production rose until July is, at first sight, unexpected and disconcerting. How can it be explained?

The Explanation

The fact is that our great bombing effort in 1943-44 was matched by a great industrial effort in Germany, the effect of which was largely to offset the diminution in output which the offensive would otherwise have caused. Just when we, and the Americans soon after us, were massing our air power, for the first time, against the Germans, they on their side were massing their industrial power, also for the first time, against us. There has been a good deal of misconception of the position on the latter subject. It has been commonly supposed that even before the war Germany had mobilized all her resources. She had not done so. The American Survey points out that civilian consumption in Germany in 1939 was above the level of 1929, and that it had fallen only slightly by 1941. "This shows," it says, "that Germany entered the war with a 'guns *and* butter' philosophy which was continued well after the initial defeats in Russia."

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The German civilian population was never drafted into employment directly serving the war effort to the same extent as was the British. Germany had a big reserve of rope to haul on in 1942.

Her intensive effort started when Albert Speer was appointed Minister for Armament Production in February, 1942. He held the office for two and a half years. The rationalizing policy which he introduced resulted in a three-fold increase of Germany's munition production. Even then, the country's manpower and (especially) womanpower were not fully mobilized, nor was machinery capacity utilized to the full. The working of night-shifts was the exception in Germany. Nevertheless, the Speer administration succeeded in bringing about a striking increase in the output of munitions. How much greater it would have been but for the Allied air attacks must be a matter of conjecture. The dispersal of German industry in 1944 was another major reason for the failure of area bombing to achieve more than it did.

Germany on the Downgrade

The attacks undoubtedly damped down production in 1943-44, and from the middle of the latter year the fall became steep and finally catastrophic. The Survey states:

"From 1944, onwards, all sectors of the German economy were in rapid decline. This collapse was due to the results of air raids working with other causes. . . . 'The German economy,' Speer wrote in his report of 15th March (1945), *is heading for an inevitable collapse within* 4-8 *weeks.' Even if the final military victories that carried the Allied armies across the Rhine and the Oder had not taken place, armament production would have come to a virtual standstill by May; the German armies, completely bereft of ammunition and motive power, would almost certainly have had to cease fighting by June or July."*

What it comes to is this, that land power by the rapidity of its action robbed air power of the opportunity of demonstrating its ability to disarm the enemy completely. That was ungrateful of land power, for it owed its freedom to move so quickly in large measure to the fact that the Allied airmen had wrecked many of the enemy's sources of supply, had wrought havoc with his communications, and had cut down his supplies of oil to nearly vanishing point. (Land power, it should be added, repaid the service by overrunning the V1 and V2 bases which air power had been unable to eliminate.) It was thus that the German defence was sapped and the Reich laid open to invasion.

Mobility Destroyed

General Eisenhower, in his report of 13th July, 1945, on the operations in Europe in 1944-45, acknowledged generously the contribution made by the Allied air forces to the success of his troops, through the immobilizing of the enemy and the blocking of the supply channels:

"Throughout the struggle it was in his logistical inability to maintain his armies in the field that the enemy's fatal weakness lay. Courage his forces had in full measure, but courage was not enough. Reinforcements failed to arrive, ammunition and food alike ran short, and the dearth of fuel caused their power of tactical mobility to dwindle to the vanishing point. In the last stages of the campaign they could do little more than wait for the Allied avalanche to sweep over them."

Field-Marshal Montgomery paid tribute also to the airmen's help. In a message to Marshal of the Air Force Portal at the beginning of May he said: "The mighty weapon of air power has enabled us firstly to win a great victory quickly, and secondly to win that victory with fewer casualties than would otherwise have been the case." Sir Charles Portal, in replying, said that "the thought that we may have been able to reduce the casualties suffered by your gallant men has given us all the greatest possible satisfaction."

The armies had to give the death-blow, but it was a sorely stricken quarry that faced them when they closed in for the kill. It had been mortally wounded already.

Our Bombing Policy

Germany was hamstrung by the attack from the air. What we had hoped for in the early days of the war had come to pass. The curve which our bombing policy traced was a curious one. It ended more or less where it started. We began in 1940 by attacking oil targets and railway centres such as Hamm. After a time we came, it seems, to the conclusion that we were not bombing the right objectives; but we were. What was wrong was that we were unable at that time to do the job on a big enough scale. We had not enough aircraft, or big enough bombs, or the necessary navigational aids, to bomb them effectively. When we were in a better position in these respects our bombing policy had changed, to some extent as the result of a change of *personnel* in Bomber Command. At all events, we concentrated from the early summer of 1942 onwards on attacking centres of population and industry, evidently hoping for a two-fold return, moral and material, from our expenditure of bombs upon them. It was only in 1944, partly, it seems, in consequence of the infiltration of American ideas, that we decided to resume the specific

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attack on oil and transportation. We had then the equipment and the technique which we lacked in 1940, and the new campaign was as conspicuous a triumph as the former one had been a disappointment. The assault on the German railway system was particularly successful.

The Attack on Industry

In combination with the attack on oil, it was more effective than the general offensive against industry for the immediate purpose of crippling German resistance. It does not follow, however, that the latter offensive was not worth-while. In a lecture at the Royal United Service Institution on 27th March, 1946, Sir Henry Tizard said:

"The actual effort in man-power and resources that was expended in bombing Germany was greater than the value in man-power of the damage caused, and the military success of our bombing would have been even less if the Germans had devoted to the strengthening of their defences more of their scientific resources which they either wasted altogether or diverted to less important tasks." (*"Journal of the R.U.S.I.," August,* 1946, *p.* 341.)

Such an assessment of the value of the strategic air offensive seems to the present writer to be highly challengeable, and it finds little support in the conclusions of the American Survey, whose views on the effect of the offensive upon Germany's man-power are given below. The attacks on the industrial centres were part and parcel of a dipping air strategy which could only be tested by trial and error. The campaigns against transportation and oil might not have given the results which they did. That would not have mattered in the long run. The Allies had another iron in the fire, the fire that was kindled from the air. The campaign against production would have made it impossible in any event for Germany to continue the war. It had, in fact, destroyed her war potential, apart from warlike equipment in being, by the end of 1944. It had seemed to be yielding no results, but it was, all the time. The German spurt in production in 1943-44 was deceptive. The results of the air campaign came with a rush at the end. The mighty war machine of the Reich was running down. The Germans were at the end of their tether. They were kept going by the momentum of forces whose renewal was impossible. "How do we know they are going to break?" They were breaking even before the spurt died down. We did not know it at the time, but it was a fact.

To draw a line at the beginning of May, 1945, to try to strike a balance then as between manpower expended on the bombing effort and the manpower value of the damage caused, and to conclude that the sum works out on the wrong side for the air offensive, to do that is, for the reasons given above, to arrive at a doubtfully correct answer, but it is in any case to close the account too soon. In May, 1945, the cumulative effects of the past bombing had not yet been fully felt, and bombing on a still greater scale would have come if the war had gone on. Even if the British Lincoln (a larger Lancaster) and the American Super-Fortress (the B-29) had not come into action in Europe, the natural growth of the air offensive would have overshadowed everything that had gone before. What would the state of Germany have been by the end of 1945? One need not assume that atomic bombs would have had to be dropped to foresee that little would have been left of any of the major towns of the Reich. Most of them were in an unholy mess as it was. They would have been hardly more than a name on the map by the close of the year. And with the ending of them as centres of production the war would have been ended, too. There would have been nothing left in Germany to sustain the fight—and also nothing left in the argument that the bombing effort did not give value for the work put into it.

The Drain on Germany's Manpower

The attacks on the cities had already drained Germany's manpower by the middle of 1944. Already in the spring of 1942 it was known that our raids had immobilized a huge force in Germany—a force officially estimated in April, 1942, to number more than a million and a half soldiers and civilians. Half of these, it was stated, were the crews manning the anti-aircraft guns and searchlights. The other half were wardens, fire-fighters, demolition men, bomb-disposal squads, ambulance and hospital staffs and others employed on a full-time basis on various duties of passive defence. These, however, were by no means all who were pinned down by the air offensive.

How great was the total number immobilized is shown in one of the most instructive chapters of the American Survey. It shows that in mid-1944, when war production and the air offensive were both at the peak, about five million persons were involved. The estimate given for this purpose is expressed as a variable one with lower and upper limits of 4,300,000 and 5,450,000 respectively. These figures are arrived at in the following way:

First, there were the casualties inflicted upon the labour force by the Allies' raids. These the Survey estimates at 250,000 up to mid-1944. The total civilian casualties attributable to bombing are put in the longer report at a million, of which 375,000 were fatal, and in the *Summary* report at just over 1,100,000, including 305,000 fatal.

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These figures cannot but be thought modest in comparison with the immense material destruction caused. The human losses were kept down as a result of the adoption in Germany of the system of very strong and massive air-raid shelters, each of them capable of giving complete protection to about five thousand people. A competent observer of the devastation of the Ruhr has expressed the opinion: "Had Germany relied on such flimsy constructions as our Andersons and Morrisons, or our surface shelters, the land would have been depopulated" (Geoffrey Gorer in *The Fortnightly*, December, 1946).

Secondly, the Survey states, there was the shift from productive to unproductive work due to factories, oil plants, etc., being put out of action. This shift, it calculates, reduced the direct labour force by something between 1,500,000 and 2,000,000 workers.

Thirdly, the physical destruction caused by bombing was a major factor in keeping labour out of war production or the Wehrmacht. The destruction necessitated reconstruction or dispersal of plants, reprovision of housing, relaying of tracks, and restoring of productive plant and workers' accommodation. The number of workers so diverted was between 750,000 and 1,200,000. A great labour force was locked up in the construction of underground factories for the synthetic oil, airframe, motor, machinery and electrical equipment industries; in the last months of 1944 it amounted to about 40 per cent. of all industrial construction. It was necessitated solely by the air offensive.

Fourthly, the Survey estimates that between 1,000,000 and 1,200,000 workers had to be employed in replacing household goods lost in the raids, and were consequently not available for war production.

Fifthly, there were the workers employed in the production of the anti-aircraft artillery and the ammunition for it and the personnel engaged in servicing the anti-aircraft guns and searchlights, amounting in all to about 800,000.

The Immobilized Host

One would expect to find a sixth class, and a very important one. It is that of the workers employed in producing the fighter aircraft used to intercept the Allied bombers and the personnel engaged in flying the fighters. The Survey found it impossible to apportion the fighter machines as between duty at the front, defence against tactical bombers, and defence against strategic bombers, and for that reason omitted this category. In the present writer's opinion the number of fighters (and especially night fighters) assigned to defence against strategical air attack would be substantially greater than that of the other two sub-classes in question. If the workers and airmen so employed were included they would bring the volume of diverted man-power to a total very considerably in excess of the upper limit of 5,450,000 given by the Survey. The total might be 6,000,000 or even more.

The effect upon Germany's war effort of the tying down of this great mass of workers and personnel became seriously prejudicial once the inflow of foreign labour began to decline in 1943. It was by employing the latter kind of labour on a great scale that Germany was able to increase her production. Evidence tendered to the International Military Tribunal at Nuremberg on 12th December, 1945, showed that by January, 1945, approximately 4,795,000 foreign civilians had been put to work for the German war effort in the Old Reich, and that about two million prisoners of war were also employed in the armament industry. (*The Trial of German Major War Criminals*, Part II, H.M.S.O., 1946, pp. 314, 332). These sources of recruitment naturally dried up when the tide of German successes began to ebb. "The growing requirements for men at the Front," says the Survey, "and the depletion of the supply of German men at home became from 1942 onwards the dominant factors in the situation." The five or six million persons pinned down in the hinterland by the strategic bombing of it might have been a reservoir for the reinforcement which the German armies so sorely needed in the last year of the war. If the air offensive had done nothing more than sterilize this huge labour and potential military force, it would have justified itself; and only by being directed against the widespread centres of industry could it have had the results which it had in this particular respect.

The Effect on Matériel

Not only personnel was immobilized; matériel was, too. The bombing of the cities led to the retention in Germany of weapons badly needed by the armies. The Survey states:

"The strength of the artillery might have been almost doubled if production of heavy anti-aircraft guns had not been necessary; on any part of the front where there were in fact two guns, there might have been four. . . . Most clear is the marked effect of the 1944 *air raids on ammunition production. It is estimated that bombing resulted in a reduction of output of about* 14 *per cent. The production of heavy anti-aircraft ammunition absorbed an additional* 9 *per cent. of the actual production of ammunition. In sum, the cost of bombing in terms of ammunition made available to the army was on the order of* 22 *per cent."*

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The General Military Effect

The facts given in the three foregoing sections provide an answer to those critics of the strategic air offensive who allege that it was an unwise diversion of effort, that it achieved no *military* purpose, and that its failure was shown when the Allied armies had to finish the job in the end. Most certainly it achieved a definitely military purpose by keeping out of the field a million or more Germans who would otherwise have been there and by depriving those who were there of nearly a quarter of the munitions which otherwise they would have had. It operated, in fact, as a kind of holding attack which pinned down a substantial, possibly a critical, proportion of the Wehrmacht. That was, beyond question, a direct contribution to the success of the Allies' ground operations, distinct from and additional to the service rendered in the disruption of the enemy's railway network and the consequent clogging of his channels of reinforcement and supply.

Transportation as a Target

The service last referred to was the most valuable one which air power was able to render to the Allied armies. In comparison with its immediate effect the result of the attack on industry was a little disappointing; at all events, it was a result which was subject to a time-lag. For that reason it might be asked whether the attack on transportation could not have been substituted for that on industry and the terrible devastation of the cities thus averted. The answer is that it would not have been averted, given the conditions in which the transportation targets in Germany had to be attacked, that is, from the great heights forced upon the bombers by the very powerful defences. It was in the raids against railway communications that many of the Germans suffered the worst devastation. That fact will be apparent from the details given in later pages of this study. They show that Dr. M. W. Royse was mistaken when he stated without any qualification (*Aerial Bombardment*, 1928, p. 225) that the bombing of lines of communications and transportation, including junctions and terminals (which he rightly held to be legitimate objectives) would not necessarily involve devastation. It is clear that the German cities would not have escaped if the strategic air offensive had been restricted to transportation. If the urban factories had been avoided there would have been all the more bombs for the railway targets, which were largely in the towns, and the destruction would probably have been no less than it was. That was the inevitable consequence of geographical actuality. It was that actuality which dictated the doom of the cities. They were bound to suffer in a war in which movement was no less vital an objective than production and the centres of production happened to be also pivotal points of the railway network.

That the intensive campaigns against transportation and oil might have been begun at an earlier date than they were is a proposition for which there is more to be said. During the whole war Bomber Command dropped just over 430,000 tons of bombs on industrial towns and a little less than 240,000 tons on transportation and oil targets. It is possible that quicker results would have been achieved if the latter figure had been stepped up at the expense of the former. But one is here in the realm of speculation, and the light which follows the event is not necessarily that in which the wisdom of the policy that precedes it should be seen.

The Effect on Morale

Another criticism of the air offensive cannot be disposed of so quickly. It is that the offensive failed to achieve the moral effect which the champions of air power had claimed that it could achieve. There had been great expectations on this score before the war and even after it had begun. General Smuts, no wishful thinker, stated in a broadcast from Pretoria, for instance, on 4th September, 1943:

"If German internal morale broke in 1918, *when Germany was intact and had escaped all the ravages of war which she had inflicted on her neighbours, how long will she endure a devastation worse than that of the Thirty Years War? The fortress of Europe will disappear physically before this air onslaught by night and day. And its effects on civilian morale will be even more devastating than its physical effects."*

There was a number of reasons why the effect upon morale was less than that expected. The first was that insufficient allowance had been made, on the one hand, for the natural docility of the German people and their sheeplike attitude to their bell-wethers, and, on the other, though to a less extent, for the effectiveness of the control exercised by the Gestapo. The Germans were "well drilled and well gagged and well cowed" to a degree which it was difficult for us to understand. Probably no other people on earth would have been so uncomplaining under the terrible hammering to which they were subjected. It is evident that they lived in greater terror of their own masters than of our bombers. If they had not, they would probably have staged on a bigger scale and more successfully in the spring of 1944 the revolt which was attempted in a rather futile way later in that year. The spring of 1944 was the likely time, after the terrific battering of Berlin during the winter. The

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people of Hanover, at any rate, were ready to throw in the sponge by that time, according to the report of an experienced Press correspondent, Noel Monks, who wrote in the *Daily Mail* of 11th April, 1945:

"After a three-hours complete tour of a city that in peace time had nearly 500,000 population, I gained the impression that Hanover would have surrendered to a county fire brigade had they marched in a year ago. Two hundred thousand people were bombed into a state of hopelessness ages ago."

At other cities the Allied troops were received with "Welcome" placards and cheers. There was not much sign of the will-to-war in the German people when the end came. It must have weakened long before. The United States Strategic Bombing Survey (*Summary Report*) states:

"The morale of the German people deteriorated under aerial attack. If they had been at liberty to vote themselves out of the war, they would have done so well before the final surrender. In a determined police State, however, there is a wide difference between dissatisfaction and expressed opposition."

The Psychological Appeal

German morale might have been strained to breaking point if it had not been sustained during the last two years of the war by a buttress of the Allies' fashioning. The attack on morale which air power can make is not likely to be successful unless it is backed by a psychological appeal that will second and support it. There must be some palatable alternative to resistance to the last ditch. If a nation is to be induced to come to terms with its opponent, there must be, first, some terms; secondly, some improvement in them upon the probable consequences of continued resistance. No such terms were available to Germany from 1943 onwards.

They had been available in the early days of the war. We were prepared to treat with Germany then (indeed, with the Hitler régime) if she would march her troops out of the territory she had invaded. Our position in this respect was made clear in the debates in both Houses of Parliament on 12th October, 1939. Our war aim at that stage was simply to restore the *status quo*. Later, it changed to the dismissal by the Germans of the Nazi rulers; they were repeatedly urged to do so by our propaganda service. Later still, our policy changed again, and the change was a momentous one.

The Blunder of Casablanca

On 14th January, 1943, President Roosevelt and Mr. Churchill met at Casablanca. On 24th January, at the end of the meeting, they held a Press conference, at which the President reminded the correspondents that General U. S. Grant's initials had inspired his nickname of "Unconditional Surrender" Grant. Today, said the President, we should insist on unconditional surrender, as Grant did, the unconditional surrender of Germany, Italy and Japan; and the conference that had just ended might be known, he suggested, as the "unconditional surrender meeting." Mr. Churchill, sitting beside him, said "Hear, hear."

The Grant precedent was hardly apposite to the situation dealt with at Casablanca. It related to the surrender of Lee's army. To speak of the unconditional surrender of a Government was an innovation. No such condition precedent had ever been attached in modern times to the ending of a war. The Casablanca formula became a slogan and the effect was in all probability to prolong the war. Seeing nothing to hope for, the German army and nation fought on with the courage of despair. The Allies' pronouncement meant *debellatio* in all its grim reality.

That the pronouncement was at least an error of judgment was appreciated in some quarters at the time. Capt. H. C. Butcher records in his diary (*Three Years with Eisenhower*, 1946, p. 443) under the date of 14th April, 1944, referring to opinion at Washington:

"There is a feeling that, at Casablanca, the President and the Prime Minister, more likely the former, seized on Grant's famous term without realizing the full implications to the enemy. Goebbels has made great capital with it to strengthen the morale of the German army and people. Our psychological experts believe we would be wiser if we created a mood of acceptance of surrender in the German Army which would make possible a collapse of resistance similar to that which took place in Tunisia. They think if a proper mood is created in the German General Staff, there might even be a German Badoglio."

The Wrong Turning

There was much to be said, of course, for the policy of underlining the completeness of Germany's defeat by declining to discuss any terms with her. The Allies' victory had, this time, to be unmistakable. But there was a case, too, for not driving her to the last ditch, with its sequel for the Nazi chiefs of arraignment at a Bloody Assize. There would have been advantages in finishing the war before the Russian steam-roller had crunched its way to Berlin. If it had ended a year earlier than it did we might have achieved the immediate and the ultimate purposes for which we went to war in 1939. They were to secure the freedom of Poland and to prevent a single Great Power from dominating Europe. As it was, the insistence on unconditional surrender

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doomed our strategic air offensive to failure so far as one of the aims of that offensive was to weaken the German will-to-war to breaking point.

To the criticism that air power proved itself incapable of achieving the moral overthrow which its advocates expected, the short answer is that it was not given a fair chance of doing so. Our political warfare took a wrong turning at Casablanca. We continued to drop leaflets and to send out radio messages urging the German people to get rid of the Nazis, but we gave them no inducement to do so. Whether the Nazis went or stayed, the German nation as a whole was to pass under the Caudine Forks. There was, in fact, some asymmetry between one part of our policy and another. It was as if our left hand did not know what our right hand was doing.

Military and Moral Effect

There may have been another reason, too, for the apparently slight effect upon German morale, a reason which probably contributed also to the surprising rise of German war production in 1942-44. We seem to have gone about the air attack on morale in the wrong way. The moral effect which air power can produce should come as an incidental and consequential result of the military effect which it is the only legitimate purpose of the air offensive to achieve. Both results, military and moral, will be brought about by action designed to paralyse munitionment. It is the enemy's military strength which must be attacked—attacked at its sources. That is the principle of the military objective. The successful application of that principle will yield the moral effect as a by-product. It will create despair, and despair collapse.

It is not suggested that anyone in a position of decisive authority in this country would have approved the extreme proposals for producing moral effect which have been advocated in some quarters. No one would support in these days the views put forward by Admiral of the Fleet Lord Fisher when he was speaking off the record at The Hague in 1899. ("Moderation in war is imbecility. . . . If you rub it in, both at home and abroad, that you are ready for instant war with every unit of your strength in the first line, and intend to be first in, and to hit your enemy in the belly, and kick him when he is down, and boil your prisoners in oil (if you take any) and torture his women and children, then people will keep clear of you." (Quoted by Sir R. H. Bacon, *Life of Lord Fisher of Kilverstone*, 1929, I. 121).) This, of course, was naked terrorism, and it is not implied for a moment that our bombing policy was ever that. But undoubtedly certain public pronouncements, quoted hereafter, give some ground for believing that we expected to achieve the moral result as the primary product of the assault on the cities. The consequence was that, up to the summer of 1944, we achieved effectively neither the military nor the moral effect sought. We had set about the task of breaking Germany's will to war in a way which was as likely as not merely to harden it instead.

The Effect Substantial

These considerations must be kept in mind by anyone reading the record of the Allied air offensive against the German centres of production and population. The offensive, so far as it was directed against such centres, might seem at first sight to have failed to deliver the goods which it had promised. Critics might complain that it did not succeed in disarming Germany either materially or morally. Materially, it has already been explained, the attacks on the cities did reduce substantially her supply of munitions and of men, and deprived her, in all probability, of the marginal armed strength the accession of which to her reserves might well have made all the difference between success and failure in her final resistance. Morally, the offensive would probably have yielded results also if our political warfare had been a little wiser than it was. In any case, the leaven was working; the acclamation with which the Allied troops were received in many cities was evidence of that.

A curious fact was that the inhabitants seemed to harbour no resentment against the Allies. (They were much more resentful a year and a half later when German families in Hamburg and elsewhere in the British zone were turned out of their houses to make room for B.A.O.R. wives.) Their cities were knocked to pieces but they took it all as the fortune of war. Such fatalism was remarkable in view of the previous propaganda about "terror" raids. No cities had ever suffered as did the German. No city in Britain was damaged to anything approaching the same degree as Berlin or the fourteen towns of the Ruhr or the fifty towns referred to in addition. None of our towns received a load of bombs even remotely approximating the 10,000 tons dropped on each of thirteen cities in Germany—Berlin, Essen, Cologne, Düsseldorf, Stuttgart, Duisburg, Hamburg, Frankfurt, Gelsenkirchen, Dortmund, Mannheim, Kiel and Hanover. Berlin, alone, received more than 40,000 tons of Bomber Command's explosive and incendiary bombs.

The Scope of the Study

The raids by which twelve of the thirteen cities just referred to (as well as many others) were wrecked are described in the chapters that follow. Kiel, it will be seen, is not dealt with along

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with the rest. That is not because Kiel escaped lightly. Assuredly it did not. A visitor to Kiel wrote in December, 1945:

"The harbour is a shambles. Burnt-out and battered factories and stores, wrecked dockside installations, and shipyards which are merely tangled masses of steel are everywhere. . . . The city built along the harbour's reach was ruined. . . The Town Hall, Castle, University, Municipal Theatre, Post Office and main railway station—not a single public building escaped." (*"British Zone Review," published by the Control Commission for Germany (B.E.), 8th December,* 1945).

But the attack on the ports, shipbuilding yards, submarine pens and naval bases was really part of the operations at sea designed to maintain our blockade of Germany and to prevent Germany from blockading us. Not to cover these operations is by no means to deny their vital importance. They are merely outside the scope of the present study; its subject is air power, not sea power, and the cities. Sea power was mighty, too. Air power alone could not have left Germany drained of oil. She could have had plenty of it if she could have got it, as we did, in tankers from overseas. What prevented her from doing so was sea power.

To have cast the net of this survey more widely would not have resulted in a yield of very much value for the particular purpose which was in view. For that purpose the experiences of our own cities in Great Britain and Northern Ireland were of no great consequence, though tragic enough for their inhabitants. Germany never organized her air arm effectively. She never had a Bomber Command or the conception of air power which the existence of that Command reflected. The V1 and V2 campaigns were a confession of the failure of the Luftwaffe and were in themselves futile. It is to what happened in Germany and Japan that one must look for the materials for a study of the impact of air power upon cities.

The Cities of Japan

Japan's cities, like Germany's, suffered terribly. Many of them were already in ruins before August, 1945. Tokyo and some others had been swept by hurricanes of flame which left them devastated to an even more complete extent than were Hiroshima and Nagasaki subsequently. High explosives and petroleum jelly incendiaries were agents of destruction not less effective, when used in the mass, than the atomic bomb. The latter only completed a tragic story which the chemical bomb had carried almost to the final chapter. It was pre-atomic bombing that broke the Japanese will-to-war and capacity to wage war.

Japan was not beaten by the atomic bomb. She was already a broken nation when the first one fell. Her surrender was inevitable; the only question was when it would come. The reports published in 1946 of the United States Strategic Bombing Survey leave no doubt upon this point.

The Atomic Bomb and Japan's Surrender

In the *Summary Report* (*Pacific War*), it is stated:

"It seems clear that, even without the atomic bombing attacks, air supremacy over Japan could have exerted sufficient pressure to bring about unconditional surrender and obviate the need for invasion. Based on a detailed investigation of all the facts, and supported by the testimony of the Japanese leaders involved, it is the Survey's opinion that certainly prior to 31st December, 1945, *and in all probability prior to 1st November,* 1945, *Japan would have surrendered even if the atomic bombs had not been dropped, even if Russia had not entered the war, and even if no invasion had been planned or contemplated."*

The Survey's other report, entitled *The Effects of Atomic Bombs on Hiroshima and Nagasaki,* states:

"The decision to seek ways and means to terminate the war, influenced in part by knowledge of the low state of popular morale, had been taken in May, 1945, *by the Supreme War Guidance Council. . . . A quip was current in high Government circles at this time (August,* 1945) *that the atomic bomb was the real Kamikaze (the so-called suicide aircraft squad), since it saved Japan from further useless slaughter and destruction. It is apparent that in the atomic bomb the Japanese found the opportunity which they had been seeking to break the existing deadlock within the Government over acceptance of the Potsdam terms."*

Moral Effect in Japan

The Survey's *Summary Report* makes it clear that the strategic air offensive had a greater moral effect in Japan than it had had in Germany. In an analysis of the state of morale in the former country at various dates the Survey states that prior to the surrender 68 per cent. of the population had come to the conclusion that Japan could not achieve victory. "Of those who had come to this belief over one-half attributed the principal cause to air attacks other than the atomic bombing attacks, and one-third to military defeats." The general feeling of hopelessness had a reaction in Japan which it did not have in Germany. "One of the important factors inducing Japan's leaders to accept unconditional surrender was a realization that the Japanese armed forces had lost their ability to

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protect the people, and that under the impact of direct air attack and lowered livelihood their confidence in victory and determination to continue the war was rapidly declining."

The Atomic Bomb and Future Wars

What the atomic bomb did was to give Japan an excuse, a face-saving opportunity for pulling out of a war that was already lost. It was lost because pre-atomic air power, supplemented by sea power, had won it for the United States. For that reason the strategic air offensive directed against Japan is, quite apart from the new factor introduced by the dropping of the atomic bombs, both instructive and of lasting significance. It has lessons for the student of air warfare not less important than those taught by the parallel offensive against Germany. It would be entirely wrong to assume that everything that happened before August, 1945, is now of merely academic interest. The atomic bomb did not erase from the slate all the prior teaching by any means.

That point was driven home by Lord Tedder in a talk which he gave to Press correspondents on 10th September, 1946. He said:

"A ruthless analysis of the last war would give us valuable lessons for the future. You may say that if there is another war it will be fought with guided rockets travelling 1,000 *miles and more and carrying atomic bombs, with bombers and fighters all as dead as the dodo. Some time, perhaps, but not yet; we must live in the present while keeping pace with future possibilities . . . A bomb is just a bomb whether it is an atomic bomb or a grand slam. Recent scientific developments have not superseded but have enormously enhanced air power."*

The last conclusion was also reached in the *Third Report of the Commanding General of the United States Army Air Forces to the Secretary of War*, dated 12th November, 1945 (reprint by H.M.S.O., 1946, p. 67). In it General H. H. Arnold stated:

"The influence of atomic energy on air power can be stated very simply. It has made air power all-important. Air power provides not only the best present means of striking an enemy with atomic bombs, but also the best available protection against the use of atomic explosives."

That, too, is substantially the conclusion of the United States Stategic Bombing Survey. In the *Summary Report* (*Pacific War*) the question is asked: "Does the existence of atomic bombs invalidate all conclusions relative to air power based on pre-atomic experience?" The answer given is in the negative. The authors of the report hold that the chief lesson of the war in the Far East, the vital importance of control of the air, has not lost its validity. "The problem of the control of the air, primarily of our own air, and, should we be attacked, of the enemy's air as well, becomes of even greater significance."

(To be continued)

BENEVOLENT FUNDS

R.A.F. Quarterly contributions to the Benevolent Funds of the Commonwealth and Empire Forces for the

July, 1947, Quarter

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The Journal's Donation	21	5	0
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	21	5	0
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The Use of Atomic Bombs

STRATEGICAL AND MORAL CONSIDERATIONS

A Summary of an Article by
HENRY L. STIMSON
Published in "Harper's Magazine," February, 1947

[*Mr. Stimson was United States Secretary of War from* 1911 *to* 1913, *Secretary of State from* 1929 *to* 1933, *and Secretary of War again from* 1940 *to* 1945. *It was he who had to advise the President of the United States to use, or not to use, the atomic bomb against Japan in* 1945.]

DURING the first week in March this year the British public had the opportunity of hearing about a dozen recognized experts speaking upon the various aspects of atomic energy with special reference, as Mr. J. B. Priestley pointed out in the introductory talk, to its use as a weapon of war. Atomic (or nuclear) energy will be applicable, it appears, to peaceful as well as warlike operations; and it is the peaceful uses in which the nation as a whole will be most interested. But as members of a fighting Service, readers of this Journal will be particularly interested in its application to warfare, which has already been initiated by the atom bombing of two Japanese cities and by two experiments on shipping at Bikini.

Mr. Henry L. Stimson's article, of which the following is a summary, has been chosen because it sets forth comprehensively and clearly the strategical and moral considerations which led to the decision to use the bomb. It is also valuable as a model of strategical appreciation.

"In recent months," begins Mr. Stimson, "there has been much comment about the decision to use atomic bombs in attacks on the Japanese cities of Hiroshima and Nagasaki. This decision was one of the gravest made by our government in recent years, and it is entirely proper that it should be discussed. I have therefore decided to record for all who may be interested my understanding of the events which led up to the attack on Hiroshima on 6th August, 1945, on Nagasaki on 9th August, and the Japanese decision to surrender on 10th August. No single individual can hope to know exactly what took place in the minds of all of those who had a share in these events, but what follows is an exact description of our thoughts and actions as I find them in the records and in my clear recollection."

PLANS AND PREPARATIONS

The possibilities of using atomic energy for purposes of warfare were first brought to Mr. Stimson's notice in the autumn of 1941. He was then a member of a committee appointed by President Roosevelt to advise the President on questions of policy relating to the study of nuclear fission; for nearly four years thereafter he was directly connected with all major decisions of policy on the development and use of atomic energy, and from May, 1943, to September, 1945, he was directly responsible to the President for the administration of the entire undertaking, and the President's senior adviser on the military employment of atomic energy.

"The policy adopted and steadily pursued by President Roosevelt and his advisers," continues the writer, "was a simple one. It was to spare no effort in securing the earliest possible successful development of an atomic weapon. The reasons for this policy were equally simple. The original experimental achievement of atomic fission had occurred in Germany in 1938, and it was known that the Germans had continued their experiments. In 1941 and 1942 they were believed to be ahead of us and it was vital that they should not be the first to bring atomic weapons into the field of battle. Furthermore, if we should be the first to develop the weapon we should have a great new instrument for shortening the war and minimizing destruction. At no time, from 1941 to 1945, did I ever hear it suggested by the President, or by any other responsible member of the government, that atomic energy should not be used in the war. All of us, of course, understood the terrible responsibility involved in our attempt to unlock the doors to such a devastating weapon; President Roosevelt particularly spoke to me many times of his own awareness of the catastrophic potentialities of our work. But we were at war, and the work must be done. I therefore emphasize that it was our common objective, throughout the war, to be the first to produce an atomic weapon and use it. The possible atomic weapon was considered to be a new and tremendously powerful explosive, as legitimate as any other of the deadly explosive weapons of modern war. The entire purpose was the production of a military weapon; on no other ground could the war-time expenditure of so much time and money have been justified. The exact circumstances in which that weapon might be used were unknown to any of us until the middle of 1945, and when that time came, as we shall presently see, the military use of atomic energy was

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connected with larger questions of national policy. . . .

"As time went on it became clear that the weapon would not be available in time for use in the European theatre, and the war against Germany was successfully ended by the use of what are now called conventional means. But in the spring of 1945 it became evident that the climax of our prolonged atomic effort was at hand. By the nature of atomic chain reactions it was impossible to state with certainty that we had succeeded until a bomb had actually exploded in a full-scale experiment; nevertheless, it was considered exceedingly probable that we should by midsummer have successfully detonated the first atomic bomb. This was to be done at the Alamogordo Reservation in New Mexico. It was thus time for detailed consideration of our future plans. What had begun as a well-founded hope was now developing into a reality."

On 15th March, 1945, Mr. Stimson had his last talk with President Roosevelt. There had been rumours that the scheme would be found impracticable and that two at least of the technical experts were hood-winking the President. Mr. Stimson succeeded in restoring the President's confidence by pointing out the very high standing of the leading scientists who were working on the scheme. He also outlined the probable future of atomic energy and made a forecast of when it was likely to be available in the form of a bomb. And he even discussed with the President the control of atomic energy and atomic weapons after the war, insisting that this ought to be settled before the first atomic bomb was dropped on the enemy and that a public statement ought to be issued immediately after that event.

"This conversation," writes Mr. Stimson, "covered the three aspects of the question which were then uppermost in our minds. First, it was always necessary to suppress a lingering doubt that any such titanic undertaking could be successful. Second, we must consider the implications of success in terms of its long-range post-war effect. Third, we must face the problem that would be presented at the time of our first use of the weapon, for with that first use there must be some public statement."

Soon after that conversation practically the whole world heard with sorrow and dismay of the sudden death of President Roosevelt. He was succeeded by President Truman. This is poignantly and vividly described by Mr. Stimson.

"I did not see Franklin Roosevelt again," he writes. "The next time I went to the White House to discuss atomic energy was 25th April, 1945; and I went to explain the nature of the problem to a man whose only previous knowledge of our activities was that of a Senator who had loyally accepted our assurance that the matter must be kept a secret from him. Now he was President and Commander-in-Chief, and the final responsibility in this as in so many other matters must be his. President Truman accepted this responsibility with the same fine spirit that Senator Truman had shown before in accepting our refusal to inform him.

"I discussed with him the whole history of the project. We had with us General Groves, who explained in detail the progress which had been made and the probable future course of the work. I also discussed with President Truman the broader aspects of the subject, and the memorandum which I used in this discussion is again a fair sample of the state of our thinking at the time."

This memorandum is quoted verbatim below:

"Memorandum Discussed with President Truman, 25th April, 1945

"1. Within four months we shall in all probability have completed the most terrible weapon ever known in human history, one bomb of which could destroy a whole city.

"2. Although we have shared its development with the U.K., physically the U.S. is at present in the position of controlling the resources with which to construct and use it, and no other nation could reach this position for some years.

"3. Nevertheless, it is practically certain that we could not remain in this position indefinitely:

(*a*) Various segments of its discovery and production are widely known among many scientists in many countries, although few scientists are now acquainted with the whole process which we have developed.

(*b*) Although its construction under present methods requires great scientific and industrial effort and raw materials, which are temporarily mainly within the possession and knowledge of U.S. and U.K., it is extremely probable that much easier and cheaper methods of production will be discovered by scientists in the future, together with the use of materials of much wider distribution. As a result, it is extremely probable that the future will make it possible for atomic bombs to be constructed by smaller nations or even groups, or at least by a larger nation in a much shorter time.

"4. As a result, it is indicated that the future may see a time when such a weapon may be constructed in secret and used suddenly and effectively with devastating power by a wilful nation or group against an unsuspecting nation or group of much greater size and material power. With its aid even a very powerful unsuspecting nation

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might be conquered within a very few days by a very much smaller one. . . .*

"5. The world in its present state of moral advancement compared with its technical development would be eventually at the mercy of such a weapon. In other words, modern civilization might be completely destroyed.

"6. To approach any world peace organization of any pattern now likely to be considered, without an appreciation by the leaders of our country of the power of this new weapon, would seem to be unrealistic. No system of control heretofore considered would be adequate to control this menace. Both inside any particular country and between the nations of the world, the control of this weapon will undoubtedly be a matter of the greatest difficulty and would involve such thoroughgoing rights of inspection and internal controls as we have never heretofore contemplated.

"7. Furthermore, in the light of our present position with reference to this weapon, the question of sharing it with other nations, and, if so shared, upon what terms, becomes a primary question of our foreign relations. Also our leadership in the war and in the development of this weapon has placed a certain moral responsibility upon us which we cannot shirk without very serious responsibility for any disaster to civilization which it would further.

"8. On the other hand, if the problem of the proper use of this weapon can be solved, we would have the opportunity to bring the world into a pattern in which the peace of the world and our civilization can be saved.

"9. As stated in General Groves's report, steps are under way looking towards the establishment of a select committee of particular qualifications for recommending action to the executive and legislative branches of our government when secrecy is no longer in full effect. The committee would also recommend the actions to be taken by the War Department prior to that time in anticipation of the post-war problems. All recommendations would of course be first submitted to the President."

The "Interim Committee," as it was called, under the chairmanship of Mr. Stimson, "was charged with the function of advising the President on the various questions raised by our apparently imminent success in developing an atomic weapon."

"The discussions of the committee," reports Mr. Stimson, "ranged over the whole field of atomic energy, in its political, military and scientific aspects. That part of its work which particularly concerns us here relates to its recommendations for the use of atomic energy against Japan, but it should be borne in mind that these recommendations were not made in a vacuum. The committee's work included the drafting of the statements which were published immediately after the first bombs were dropped, the drafting of a bill for the domestic control of atomic energy, and recommendations looking toward the international control of atomic energy."

The breadth of Mr. Stimson's vision is well illustrated by the following note of a joint meeting of the Interim Committee and the Scientific Panel on 31st May, 1945. He writes: "Both General Marshall and I at this meeting expressed the view that atomic energy could not be considered simply in terms of military weapons but must also be considered in terms of a new relationship of man to the universe."

"On 1st June," Mr. Stimson proceeds, "after its discussions with the Scientific Panel, the Interim Committee unanimously adopted the following recommendations:

"(1) The bomb should be used against Japan as soon as possible.

"(2) It should be used on a dual target—that is a military installation or war plant surrounded by or adjacent to houses and other buildings most susceptible to damage, and

"(3) It should be used without prior warning (of the nature of the weapon).

"One member of the committee . . . later changed his view and dissented from recommendation (3).

"In reaching these conclusions the Interim Committee carefully considered such alternatives as a detailed advance warning or a demonstration in some uninhabited area. Both of these suggestions were discarded as impractical. They were not regarded as likely to be effective in compelling a surrender of Japan, and both of them involved serious risks. Even the New Mexico test would not give final proof that any given bomb was certain to explode when dropped from an airplane. Quite apart from the generally unfamiliar nature of atomic explosives, there was the whole problem of exploding a bomb at a predetermined height in the air by a complicated mechanism which could not be tested in the static test of New Mexico. Nothing would have been more damaging to our effort to obtain surrender than a warning or a demonstration followed by a dud, and this was a real possibility. Furthermore, we had no bombs to waste. It was vital that a sufficient effect be quickly obtained with the few we had."

That the political and moral considerations involved were not overlooked is shown by the

* A brief reference to the estimated capabilities of other nations is here omitted; it in no way affects the course of the argument.

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following extract from a report by the Scientific Panel on 16th June, 1945:

"The opinions of our scientific colleagues," reads the report, "on the initial use of these weapons are not unanimous: they range from the proposal of a purely technical demonstration to that of the military application best designed to induce surrender. Those who advocate a purely technical demonstration would wish to outlaw the use of atomic weapons, and have feared that if we use the weapons now our position in future negotiations will be prejudiced. Others emphasize the opportunity of saving American lives by immediate military use, and believe that such use will improve the international prospects, in that they are more concerned with the prevention of war than with the elimination of this special weapon. We find ourselves closer to these latter views; we can propose no technical demonstration likely to bring an end to the war; we see no acceptable alternative to direct military use. With regard to these general aspects of the use of atomic energy, it is clear that we, as scientific men, have no proprietary rights. It is true that we are among the few citizens who have had occasion to give thoughtful consideration to these problems during the past few years. We have, however, no claim to special competence in solving the political, social and military problems which are presented by the advent of atomic power."

Mr. Stimson's Own Appreciation

Mr. Stimson, however, takes full responsibility for the ultimate decision, as will be seen below; and he gives his reasons in a masterly appreciation of the situation.

"The ultimate responsibility," he writes, "for the recommendation to the President rested upon me, and I have no desire to veil it. The conclusions of the committee were similar to my own, although I reached mine independently. I felt that to extract a genuine surrender from the Emperor and his military advisers, they must be administered a tremendous shock which would carry convincing proof of our power to destroy the Empire. Such an effective shock would save many times the number of lives, both American and Japanese, than it would cost.

"The facts upon which my reasoning was based and steps taken to carry it out now follow.

U.S. Policy Toward Japan in July, 1945

"The principal political, social and military objective of the United States in the summer of 1945 was the prompt and complete surrender of Japan. Only the complete destruction of her military power could open the way to lasting peace.

"Japan, in July, 1945, had been seriously weakened by our increasingly violent attacks. It was known to us that she had gone so far as to make tentative proposals to the Soviet government, hoping to use the Russians as mediators in a negotiated peace. These vague proposals contemplated the retention by Japan of important conquered areas and were therefore not considered seriously. There was as yet no indication of any weakening in the Japanese determination to fight to the end; she had still a great military force.

"In the middle of July, 1945, the Intelligence Section of the War Department General Staff estimated Japanese military strength as follows: in the home islands, slightly under 2,000,000; in Korea, Manchuria, China proper and Formosa, slightly over 2,000,000; in French Indo-China, Thailand and Burma, over 200,000; in the East Indies area, including the Philippines, over 500,000; and in the by-passed Pacific islands, over 100,000. The total strength of the Japanese army was estimated at about 5,000,000 men. These estimates later proved to be in very close agreement with official Japanese figures.

"The Japanese army was in much better condition than the Japanese navy and air force. The navy had practically ceased to exist except as a harrying force against an invasion fleet. The air force had been reduced mainly to reliance upon 'Kamikaze,' or suicide, attacks. These latter, however, had already inflicted serious damage on our sea-going forces, and their possible effectiveness in a last-ditch fight was a matter of real concern to our naval leaders.

"As we understood it in July, there was a very strong possibility that the Japanese government might determine upon resistance to the end, in all the areas of the Far East under its control. In such an event the Allies would be faced with the enormous task of destroying an armed force of five million men and five thousand suicide aircraft, belonging to a race which had already amply demonstrated its ability to fight literally to the death.

"The strategic plans of our armed forces for the defeat of Japan, as they stood in July, had been prepared without reliance upon the atomic bomb, which had not yet been tested in New Mexico. We were planning an intensified sea and air blockade, and greatly intensified strategic air bombing, through the summer and early fall, to be followed on 1st November by an invasion of the southern island of Kyushu. This would be followed in turn by an invasion of the main island of Honshu in the spring of 1946. The total U.S. military and naval force involved in this grand design was of the order of 5,000,000 men; if all those indirectly concerned are included, it was larger still.

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"We estimated that if we should be forced to carry this plan to its conclusion, the major fighting would not end until the latter part of 1946, at the earliest. I was informed that such operations might be expected to cost over a million casualties, to American forces alone. Additional large losses might be expected among our Allies; and, of course, if our campaign were successful, and if we could judge by previous experience, enemy casualties would be much larger than our own.

"It was already clear in July that even before the invasion we should be able to inflict enormously severe damage on the Japanese homeland by the combined application of 'conventional' sea and air power. The critical question was whether this kind of action would induce surrender. It therefore became necessary to consider very carefully the probable state of mind of the enemy, and to assess with accuracy the line of conduct which might end his will to resist.

"With these considerations in mind, I wrote a memorandum for the President on 2nd July, which I believe fairly represents the thinking of the American government as it finally took shape in action. This memorandum was prepared after discussion and general agreement with Joseph C. Grey, Acting Secretary of State, and Secretary of the Navy Forrestal, and when I discussed it with the President he expressed his general approval.

"*Memorandum for the President . . . 2nd July, 1945*

PROPOSED PROGRAM FOR JAPAN

"1. The plans of operation up to and including the first landing have been authorized and the preparations for the operation are now actually going on. This situation was accepted by all members of your conference on Monday, 18th June.

"2. There is reason to believe that the operation for the occupation of Japan following the landing may be a very long, costly and arduous struggle on our part. The terrain, much of which I have visited several times, has left the impression on my memory of being one which would be susceptible to a last-ditch defence such as has been made on Iwo Jima and Okinawa, and which of course is very much larger than either of those two areas. According to my recollection, it will be much more unfavourable with regard to tank manœuvering than either the Philippines or Germany.

"3. If we once land on one of the main islands and begin a forceful occupation of Japan, we shall probably have cast the die of last-ditch resistance. The Japanese are highly patriotic and certainly susceptible to calls for fanatical resistance to repel an invasion. Once started in actual invasion, we shall in my opinion have to go through with an even more bitter finish fight than in Germany. We shall incur the losses incident to such a war and we shall have to leave the Japanese islands even more thoroughly destroyed than was the case with Germany. This would be due both to the difference in the Japanese and German personal character and the differences in the size and character of the terrain through which the operations will take place.

"4. A question then comes: Is there any alternative to such a forceful occupation of Japan which will secure for us the equivalent of an unconditional surrender of her forces and a permanent destruction of her power again to strike an aggressive blow at the 'peace of the Pacific'? I am inclined to think that there is enough such chance to make it well worth while our giving them a warning of what is to come and a definite opportunity to capitulate. As above suggested, it should be tried before the actual forceful occupation of the homeland islands is begun and, furthermore, the warning should be given in ample time to permit a national reaction to set in.

"We have the following enormously favourable factors on our side, factors much weightier than those we had against Germany:

"(*a*) Japan has no allies.

"(*b*) Her navy is nearly destroyed and she is vulnerable to a surface and underwater blockade which can deprive her of sufficient food and supplies for her population.

"(*c*) She is terribly vulnerable to our concentrated air attack upon her crowded cities and industrial and food resources.

"(*d*) She has against her not only the Anglo-American forces but the rising forces of China and the ominous threat of Russia.

"(*e*) We have inexhaustible and untouched industrial resources to bring to bear against her diminishing potential.

"(*f*) We have great moral superiority through being the victim of her first sneak attack.

"The problem is to translate these advantages into prompt and economical achievement of our objectives. I believe Japan is susceptible to reason in such a crisis to a much greater extent than is indicated by our current press and other current comment. Japan is not a nation composed wholly of mad fanatics of an entirely different mentality from ours. On the contrary, she has within the past century shown herself to possess extremely intelligent people, capable in an unprecedentedly short time of adopting not only the complicated technique of Occidental civilization but to a substantial extent their culture and their political and social ideas. Her

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advance in all these respects during the short period of sixty or seventy years has been one of the most astounding feats of national progress in history, a leap from the isolated feudalism of centuries into the position of one of the six or seven great powers of the world. She has not only built up powerful armies and navies. She has maintained an honest and effective national finance and respected position in many of the sciences in which we pride ourselves. Prior to the forcible seizure of power over her government by the fanatical military group in 1931, she had for ten years lived a reasonably responsible and respectable international life.

"My own opinion is in her favour on the two points involved in this question: (*a*) I think the Japanese nation has the mental intelligence and versatile capacity in such a crisis to recognize the folly of a fight to the finish and to accept the proffer of what will amount to an unconditional surrender; and (*b*) I think she has within her population enough liberal leaders (although now submerged by the terrorists) to be depended upon for her reconstruction as a responsible member of the family of nations. I think she is better in this last respect than Germany was. Her liberals yielded only at the point of the pistol and, so far as I am aware, their liberal attitude has not been personally subverted in the way which was so general in Germany.

"On the other hand, I think that the attempt to exterminate her armies and her population by gunfire or other means will tend to produce a fusion of race solidity and antipathy which has no analogy in the case of Germany. We have a national interest in creating, if possible, a condition wherein the Japanese nation may live as a peaceful and useful member of the future Pacific community.

"5. It is therefore my conclusion that a carefully timed warning be given to Japan by the chief representatives of the United States, Great Britain, China and, if then a belligerent, Russia by calling upon Japan to surrender and permit the occupation of her country in order to ensure its complete demilitarization for the sake of the future peace. This warning should contain the following elements:

"The varied and overwhelming character of the force we are about to bring to bear on the islands.

"The inevitability and completeness of the destruction which the full application of this force will entail.

"The determination of the Allies to destroy permanently all authority and influence of those who have deceived and misled the country into embarking on world conquest.

"The determination of the Allies to limit Japanese sovereignty to her main islands and to render them powerless to mount and support another war.

"The disavowal of any attempt to extirpate the Japanese as a race or to destroy them as a nation.

"A statement of our readiness, once her economy is purged of its militaristic influence, to permit the Japanese to maintain such industries, particularly of a light consumer character, as offer no threat of aggression against their neighbours, but which can produce a sustaining economy, and provide a reasonable standard of living. The statement should indicate our willingness, for this purpose, to give Japan trade access to external raw materials, but no longer any control over the sources of supply outside her main islands. It should also indicate our willingness, in accordance with our new established foreign trade policy, in due course to enter into mutually advantageous trade relations with her.

"The withdrawal from their country as soon as the above objectives of the Allies are accomplished, and as soon as there has been established a peacefully inclined government of a character representative of the masses of the Japanese people. I personally think that if in saying this we should add that we do not exclude a constitutional monarchy under her present dynasty, it would substantially add to the chances of acceptance.

"6. Success of course will depend on the potency of the warning which we give her. She has an extremely sensitive national pride and, as we are now seeing every day, when actually locked with the enemy will fight to the very death. For that reason the warning must be tendered before the actual invasion has occurred and while the impending destruction, though clear beyond peradventure, has not yet reduced her to fanatical despair. If Russia is a part of the threat, the Russian attack, if actual, must not have progressed too far. Our own bombing should be confined to military objectives as far as possible.

"It is important to emphasize the double character of the suggested warning. It was designed to promise destruction if Japan resisted, and hope if she surrendered. It will be noted that the atomic bomb is not mentioned in this memorandum. On grounds of secrecy the bomb was never mentioned except when absolutely necessary, and furthermore it had not yet been tested. It was, of course, well forward in our minds, as the memorandum was written and discussed, that the bomb would be the best possible sanction if our warning were rejected."

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The Use of the Bomb

"The adoption of the policy outlined in the memorandum of 2nd July was a decision of high politics; once it was accepted by the President, the position of the atomic bomb in our planning became quite clear. I find that I stated in my diary, as early as 19th June, that 'the last-chance warning . . . must be given before an actual landing of the ground forces in Japan, and fortunately the plans provide for enough time to bring in the sanctions to our warning in the shape of heavy ordinary bombing attack and an attack of S-1.' (S-1 was a code name for the atomic bomb.)

"There was much discussion in Washington about the timing of the warning to Japan. The controlling factor in the end was the date already set for the Potsdam meeting of the Big Three. It was President Truman's decision that such a warning should be solemnly issued by the U.S. and the U.K. from this meeting, with the concurrence of the head of the Chinese government, so that it would be plain that *all* of Japan's principal enemies were in entire unity. This was done, in the Potsdam ultimatum of 26th July, which very closely followed the above memorandum of 2nd July, with the exception that it made no mention of the Japanese Emperor.

"On 28th July the Premier of Japan, Suzuki, rejected the Potsdam ultimatum by announcing that it was 'unworthy of public notice.' In the face of this rejection we could only proceed to demonstrate that the ultimatum had meant exactly what it said when it stated that if the Japanese continued the war, 'the full application of our military power, backed by our resolve, will mean the inevitable and complete destruction of the Japanese armed forces and just as inevitably the utter devastation of the Japanese homeland.'

"For such a purpose the atomic bomb was an eminently suitable weapon. The New Mexico test occurred while we were at Potsdam, on 16th July. It was immediately clear that the power of the bomb measured up to our highest estimates. We had developed a weapon of such a revolutionary character that its use against the enemy might well be expected to produce exactly the kind of shock on the Japanese ruling oligarchy which we desired, strengthening the position of those who wished peace, and weakening that of the military party.

"Because of the importance of the atomic mission to Japan, the detailed plans were brought to me by the military staff for approval. With President Truman's warm support I struck off the list of suggested targets the city of Kyoto. Although it was a target of considerable military importance, it had been the ancient capital of Japan and was a shrine of Japanese art and culture. We determined that it should be spared. I approved four other targets, including the cities of Hiroshima and Nagasaki.

"Hiroshima was bombed on 6th August, and Nagasaki on 9th August. These two cities were active working parts of the Japanese war effort. One was an army centre, the other was naval and industrial. Hiroshima was the headquarters of the Japanese Army defending southern Japan and was a major military storage and assembly point. Nagasaki was a major seaport and it contained several large industrial plants of great wartime importance. We believed that our attacks had struck cities which must certainly be important to the Japanese military leaders, both Army and Navy, and we waited for a result. We waited one day.

"Many accounts have been written about the Japanese surrender. After a prolonged Japanese cabinet session in which the deadlock was broken by the Emperor himself the offer to surrender was made on 10th August. It was based on the Potsdam terms, with a reservation concerning the sovereignty of the Emperor. While the Allied reply made no promises other than those already given, it implicitly recognized the Emperor's position by prescribing that his power must be subject to the orders of the Allied Supreme Commander. These terms were accepted on 14th August by the Japanese, and the instrument of surrender was formally signed on 2nd September, in Tokyo Bay. Our great objective was thus achieved, and all the evidence I have seen indicates that the controlling factor in the final Japanese decision to accept our terms of surrender was the atomic bomb.*

"The two atomic bombs which we had dropped were the only ones we had ready, and our rate of production at the time was very small. Had the war continued until the projected invasion on 1st November, additional fire raids of B 29's would have been more destructive of life and property than the very limited number of atomic raids which we could have executed in the same period. But the atomic bomb was more than a weapon of terrible destruction; it was a psychological weapon. In March, 1945, our Air Force had launched its first great incendiary raid on the Tokyo area. In this raid more damage was done and more casualties inflicted than was the case at Hiroshima. Hundreds of bombers took part and hundreds of

* Report of United States Strategic Bombing Survey, "Japan's Struggle to End the War"—"If the Atomic Bomb had not been Used," by K. T. Compton, "Atlantic Monthly," December, 1946. Unpublished material of Historical Division, War Department Special Staff, June, 1946.

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tons of incendiaries were dropped. Similar successive raids burned out a great part of the urban area of Japan, but the Japanese fought on. On 6th August one B 29 dropped a single atomic bomb on Hiroshima. Three days later a second bomb was dropped on Nagasaki and the war was over. So far as the Japanese could know, our ability to execute atomic attacks, if necessary by many planes at a time, was unlimited. As Dr. Karl Compton has said: 'It was not one atomic bomb, or two, which brought surrender; it was the experience of what an atomic bomb will actually do to a community, plus the dread of many more, that was effective.'

"The bomb thus served exactly the purpose we intended. The Peace Party was able to take the path of surrender, and the whole weight of the Emperor's prestige was exerted in favour of peace. When the Emperor ordered surrender, and the small but dangerous group of fanatics who opposed him were brought under control, the Japanese became so subdued that the great undertaking of occupation and disarmament was completed with unprecedented ease."

Mr. Stimson's Personal Reflections

Mr. Stimson concludes with a personal reflection on the part he had had to play in these fateful events—a reflection which invites and deserves the sympathy of every reasonable man and woman, and particularly of those who, having adopted the profession of arms, can appreciate the nicer points of the writer's strategy, through which there shines a fine humanity.

"In the foregoing pages," he concludes, "I have tried to give an accurate account of my own personal observations of the circumstances which led up to the use of the atomic bomb and the reasons which underlay our use of it. To me they have always seemed compelling and clear, and I cannot see how any person vested with such responsibilities as mine could have taken any other course or given any other advice to his chiefs.

"Two great nations were approaching contact in a fight to a finish which would begin on 1st November, 1945. Our enemy, Japan, commanded forces of somewhat over 5,000,000 armed men. Men of these armies had already inflicted upon us, in our break-through of the outer perimeter of their defences, over 300,000 battle casualties. Enemy armies, still unbeaten, had the strength to cost us a million more. As long as the Japanese government refused to surrender, we should be forced to take and hold the ground, and smash the Japanese ground armies, by close-in fighting of the same desperate and costly kind that we had faced in the Pacific islands for nearly four years.

"In the light of the formidable problem which thus confronted us, I felt that every possible step should be taken to compel a surrender of the homelands, and a withdrawal of all Japanese troops from the Asiatic mainland and from other positions, before we had commenced an invasion. We held two cards to assist us in such an effort. One was the traditional veneration in which the Japanese Emperor was held by his subjects and the power which was thus vested in him over his loyal troops. It was for this reason that I suggested in my memorandum of 2nd July that his dynasty should be continued. The second card was the use of the atomic bomb in the manner best calculated to persuade that Emperor and the counsellors about him to submit to our demand for what was essentially unconditional surrender, placing his immense power over his people and his troops subject to our orders.

"In order to end the war in the shortest possible time, and to avoid the enormous losses of human life which otherwise confronted us, I felt that we must use the Emperor as our instrument to command and compel his people to cease fighting and subject themselves to our authority through him, and that to accomplish this we must give him and his controlling advisers a compelling reason to accede to our demands. This reason furthermore must be of such a nature that his people could understand his decision. The bomb seemed to me to furnish a unique instrument for that purpose.

"My chief purpose was to end the war in victory with the least possible cost in the lives of the men in the armies which I had helped to raise. In the light of the alternatives which, on a fair estimate, were open to us I believe that no man, in our position and subject to our responsibilities, holding in his hands a weapon of such possibilities for accomplishing this purpose and saving those lives, could have failed to use it and afterwards looked his countrymen in the face.

"As I read over what I have written, I am aware that much of it, in this year of peace, may have a harsh and unfeeling sound. It would perhaps be possible to say the same things and say them more gently. But I do not think it would be wise. As I look back over the five years of my service as Secretary of War, I see too many stern and heartrending decisions to be willing to pretend that war is anything else than what it is. The face of war is the face of death; death is an inevitable part of every order that a wartime leader gives. The decision to use the atomic bomb was a decision that brought death to over

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Air Power and Strategy

By Air Vice-Marshal E. J. Kingston-McCloughry, C.B.E., D.S.O., D.F.C.

THE aim in war is to destroy the enemy's will or ability to make war. Before the rise of air power, warring nations were unable to adopt direct means to achieve this aim because the source of the enemy's war power was inaccessible until the barriers which protected it were overcome.

Thus, a maritime nation like Great Britain operated a navy to secure its maritime communications, not only as the prerequisite for safeguarding its war potential but also for launching and maintaining a land offensive. The complementary role of the navy was to strangle the enemy's maritime communications so as to weaken his home front, thereby easing the task of the army which was to overcome the inner barrier presented by the enemy ground defences, and ultimately to reach the enemy's vitals.

The army—the instrument which was employed to overcome the inner barrier—was thus the most direct offensive force which could be brought to bear upon an enemy, but this force could not achieve its ultimate aim without being committed first to the preliminary task of overcoming the enemy army.

The advent of the aeroplane made it possible, for the first time, to engage directly targets at distances far beyond the range of other weapons. The new weapon was also highly flexible in that it could be switched from one target system to another rapidly and easily and thus could concentrate a crushing weight of bombardment at the selected time and place. The characteristics of long-range and flexibility combined with accuracy—an accuracy which scientific devices will continue greatly to increase—demand that the operations of air forces should conform to a different strategy from that of armies, whose function as the prime offensive instrument of war they have inevitably to assume for the future. Since aircraft can attack and destroy vital targets in the rear of the enemy's surface forces, the relative importance of disorganizing those surface forces is greatly reduced. Air Forces, in other words, can strive directly towards the achievement of the aim which an army has had to pursue by steps.

The operations of air forces have, in fact, a two-fold effect; they weaken or destroy the enemy's will or ability to wage war by their impact on his vital centres of government, war economy and war administration, and at the same time they assist the operations of surface forces by disrupting the command and communications of the enemy forces.

The importance of these basic functions of air forces, which derive directly from their prime characteristics, should not be overshadowed by too much attention to certain secondary functions. Besides reconnaissance, these secondary functions include offensive action against the enemy's sea and land forces in support of our own; and the defensive battle to destroy the enemy air forces, both on the ground and in the air. From this defensive use of air forces is derived the conception of "air superiority" which confers upon its possessor the requisite freedom from air attack indispensable for sustained and successful offence by all armed forces, both air and surface. Aircraft are also important agents in military, as well as civil transportation. Functions such as these are important and must be fully exploited, but it is necessary to rule them out of consideration whilst eliciting the changes which the rise of air power has brought about in evolution of grand strategy.

As the characteristic which exercises the most powerful influence upon our conceptions of Grand Strategy is the potentiality of air forces as agents of long-range strategical bombardment, it is on this potentiality and its future trend that our attention should be focused. World War II produced two revolutionary developments in the field of strategical bombardment. The first of these was the development of long-range pilotless aircraft and long-range rocket projectiles. The second was the development of the atomic bomb. The former provided a new and unconventional method for the delivery of a conventional explosive. The latter provided, for carriage in conventional bomber aircraft, a new and unconventional weapon of immense destructive potency. It is conceivable that future joint development along these lines may eventually supersede our current technique altogether, so that, in the history of warfare, bomber aircraft may appear merely as a transitional phenomenon in the evolution of long-range bombardment. Since, however, the strategic function of all devices for long-range bombardment is identical, it is important, during this process of evo-

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lution, that the development of new long-range weapons and techniques should be pursued jointly with the operational development of the current bomber aircraft which at present constitute the prime agent of destruction at long and even medium ranges.

From the fact that air forces are at present the most directly effective and economical agents for operating against the enemy's will or ability to wage war, it follows that the employment of air forces and associated instruments of long-range bombardment to the best advantage must be the prime consideration in the grand strategy of the armed forces as a whole. We can no longer think of warfare as consisting primarily of land campaigns supported by sea and air forces. All campaigns against the enemy's war will or ability must now be prosecuted by the most powerful combination of our armed forces. The primary objective is the very heart of the enemy's war power; his armed forces are secondary. Thus the primary instrument of war today is the long-range bombardment force; the navy and the army are essential partners.

In short, the technique of strategical bombardment has already introduced into warfare a force so novel in range and striking power that the pre-suppositions of strategy are of necessity profoundly modified. The extent of these modifications could not be realized from the small-scale air operations during World War I. Even in World War II there were strong indications that their full extent had not yet been appreciated by the majority of military thinkers. Any gulf of this sort between strategical theory and the realities of modern warfare is pregnant with danger so it behoves us to ensure, in so far as we are able, that the strategy with which Great Britain prepares for future wars is a strategy based upon present realities brought about by the rise and devastating power of long-range bombardment.

Acceptance of this new conception of the inter-relation of the roles of the three fighting Services has important implications for their reorganization in peace-time. The share of the Commonwealth's resources which is to be devoted to each of the three Services must obviously be influenced by their relative ability to bring victory rapidly and economically. The task of assessing these shares and of developing and training the three Services for their respective roles must be performed by an authority which surveys the whole war effort and which is in a position to regard the three Services as a single national instrument.

"AS YOU WERE"

By Michael Nisbet

Leaving the mess, the hut, the pub,
From second nature he would scan the skies,
Noting the wind, the drift of cloud,
Its type, its thickness, and its height,
What stars were out, the phase of moon,
Matters of ultimate concern
To him who flew.
To whom a cloud could be
White sanctuary or an end,
A single star amongst the clouds
More dazzling than a poet's dream,
The moon as brilliant as a sun,
The wind as final as a shroud.
And all familiar as his hand
To him who rode the wastes of sky
No trespasser, and with proud eyes
Nodded acquaintance to the storm.

Last night I saw him as he left for home,
His shoulders hunched, his collar up,
His eyes down on the paving stones
Hurrying to catch his train,
A bank clerk troubled by the rain.

* * * *

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a hundred thousand Japanese. No explanation can change that fact, and I do not wish to gloss it over. But this deliberate premeditated destruction was our least abhorrent choice. The destruction of Hiroshima and Nagasaki put an end to the Japanese war. It stopped the fire raids, and the strangling blockade; it ended the ghastly spectre of a clash of great land armies.

"In this last great action of the Second World War we were given final proof that war is death. War in the twentieth century has grown steadily more barbarous, more destructive, more debased in all its aspects. Now, with the release of atomic energy, man's ability to destroy himself is very nearly complete. The bombs dropped on Hiroshima and Nagasaki ended a war. They also made it wholly clear that we must never have another war. This is the lesson men and leaders everywhere must learn, and I believe that when they learn it they will find a way to lasting peace. There is no other choice."

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A FOURTH ARM OF NATIONAL DEFENCE

The "Royal Supply and Transport Services"

By Squadron Leader J. J. Harding, B.E.M.

INTRODUCTION

THIS memorandum is an effort to crystallize ideas and dreams that have been exercising my mind for the past seven years. During that time I have had varying and various contacts with the questions of supply and transport, and have joined in heated discussions with my opposite numbers in the other Services. These opposite numbers have been of all grades, as my own promotion took place, and the discussions extolled or condemned nearly every point of procedure in our own spheres; for the habit of the Service man to laud his last Command and decry his present brings inklings of S.E.A.C. to C.M.F. and tells M.E.F. in what B.A.F.O. excel.

That the ideas set forth for a fourth service are full of attacks by implication on present systems, in parts hallowed by custom, I am fully aware. Also do I realize that they are almost impracticable, since so much would have to be cut out of standing procedure. But only almost, for in some compensation many headaches would be cured and many problems never arise.

I would urge on behalf of some such scheme, the better liaison between the Services afforded by a fourth arm that answers to all, and links all personnel having a common technical language; also the simplification of the costing and financing of the service to the Services, with common documents and procedures. So many items are already "common user" that holding and distribution could well be pooled. All three fighting Services eat, sleep, move and clothe themselves in the same ways; the spanner that fits an aircraft is first cousin to the one that cares for a warship's dynamo; and petrol is used by all.

Economy, beloved of the powers that be, and of the public that gives them being, must surely approve of a system that provides common dumps, with one ceiling to their holdings, rather than many all peculiar to parent Services with their "per cent. reserves," that in aggregate freeze much equipment that neighbours need. Then, too, in the Budget, an over-all vote for stores and maintenance would both relieve the public of invidious comparisons between the "luxuries" of one arm and the "bare bones" of another, and save the costs of future "vote transfers."

That this fourth arm would have different relations with the other three is appreciated, and proposals to meet objections are offered in the text.

1.—INTENTION

General

This fourth arm is intended to be one that shall (except as defined under Section 5) be independent of the three purely *fighting* Services, and shall provide each and all with all equipment and means of transport for their operational needs.

Functional

The fourth arm shall be:

1. the channel through which all equipment is received from manufacturers;
2. the organization for its storage in such places and quantities as the strategical position requires;
3. the organization for its issue to operational units of the fighting Services as required;
4. the local holder of equipment on units and the check on misuse or hoarding;
5. the recipient of returns to bulk of surplus or unserviceable equipment;
6. the organization for repair, either in the Service or by contract, of all equipment beyond capability of operational-units workshops;
7. the service that shall dispose of all redundant stores to the public;
8. the service that shall organize all movements on L. of C., by land, sea or air, but not operate or maintain these L. of C.;
9. the service that shall plan and arrange for the construction and maintenance of all camps, stations, posts, sites and barracks;
10. the supplier of all rations except those purchased locally;
11. the provider of all transport to effect functions 1, 3, 5, 7 and 10.

2.—ORGANIZATION

The fourth arm shall be:

1. 1st, 2nd and 3rd Echelon Maintenance and Supply;
2. routine flow along all L. of C.;
3. moves of all personnel by land, sea, or air (except movements of units directed by tactics);
4. All barracks and camping facilities.

1. Maintenance and Supply

1*st Echelon Maintenance and Supply* will be setting up of reception dumps and bases, as shall be convenient geographically, to receive all equipment from manufacturers; to pack and hold

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such equipment, moving it in bulk if necessary by reason of changes in the disposition of the fighting Services; ensuring its continued serviceability by correct turnover and inspection; placing; renewing or cancelling contracts for supply; and disposing to the advantage of the public surplus, obsolete and redundant equipment, together with arisings from salvage and repair. Such base units will include workshops for the repair and maintenance of all machinery, vehicles and equipment, and will be varied in character and functions to suit the number and type of 2nd. Echelon units to be supplied; also the general nature of stores received from convenient manufacturers. They will be static, and their composition may include sites over an area if necessary. They will be under the operational control of a Master Provision Office.

2nd Echelon Maintenance and Supply will be forming of operational maintenance depots. Each depot will, as far as is possible, hold a universal range of equipment on a twelve-months' basis, but in the case of specialist equipment, *i.e.*, naval turbine spares, only those depots likely to be called upon to issue will hold them; always having regard to geographical and communicational factors. These depots will operate on an area basis, and all 3rd Echelon units in that area will be controlled by them. Workshops in such depots will be capable of heavy repairs. When the 3rd Echelon units in an area are widely dispersed and some operational units in that area are of a specialist nature, 2nd Echelon depots may be by-passed and specialist equipment issued direct from base depots to maintenance and supply parks. This would not apply to common user items, but only to major items peculiar to a Service. These depots will be static for such periods as strategy dictates.

3rd Echelon Maintenance and Supply will be the forming of maintenance and supply parks. These will be mobile or semi-mobile units, holding some six months' reserve of equipment of all types necessary for the actual operational units assigned to them. Their location will be governed by L. of C. with such units. Normally drawing from the 2nd Echelon depots, they may in some cases, if transport, etc., can be saved, be supplied direct from base depots. Their workshops will be capable of light repairs, and general overhauls. In the majority of cases they will control the local contracts for Services and the local purchases of units assigned to them.

2. Routine Flow

Each operational unit will have an attachment of R.S. & T.S. personnel, wherever possible including an officer, to demand, hold and dispose of all equipment; to operate transport necessary for this; to effect liaison with 3rd Echelon workshops; to organize unit salvage; to advise the unit administration officer in non-operational moves; to liaise with Movement Control; to arrange for all works services; and to obtain rations as required. Such detachments will not operate the unit's technical or domestic transport nor control the unit repair sections, nor will the officer i/c act as unit messing officer.

The movement of equipment will be the responsibility of R.S. & T.S. from contractor to consumer. Supply and Transport Columns will be allocated either completely or in detached platoons, to all base and operational depots to be used either for long-distance convoy work or for shuttle services to and from railheads, airfields and ports. Such S. & T. Columns will move as directed by the Movement Control branch of R.S. & T.S., regular services by convoys being maintained wherever possible. All S. & T. Columns and Movement Control will be handling goods for all services, and there will be no part loads arising from two Services' transport running on same route. The M.P.O. will keep movement priority lists wherever necessary, informing depots and all concerned. Specialist vehicles, *i.e.*, long, low loaders for aircraft, will be established only on those columns requiring them. The normal policy will be that units are responsible for the movement behind them, *i.e.*, base depots fetch from and return to contractors, operational depots to and from base depots. Movement Control may, however, direct through journeys. Maintenance and supply parks will have own transport section, not under the control of Movement Control, since their journeys will be more of individual vehicles and they will rarely deal with ports. They will clear railheads and airfields as required to operational units if desirable. The latter will have transport allotted to the R.S. & T.S. detachment for the purpose of moving stores with the unit, ration runs, works services, and the assisting of 3rd Echelon transport as necessary. Detachments from nearest base or operational depot will be maintained at every port, airfield and railhead, to receive, despatch, stow and off-load stores. Being detachments, documentation will be reduced, as it will be internal up to time of loading and from off-loading. This responsibility for movement of equipment includes rail movement and the manning of railways by service personnel in forward areas in war-time.

3. Movements

The R.S. & T.S. will be responsible for all land, sea and air moves except tactical moves of units. All necessary transit camps will be under the

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control of this Service, who will assemble all personnel, berth all ships, embark and disembark all personnel and provide permanent ships' staffs. All such moves will be made with due regard to the domestic differences between the three fighting Services, but there should be no possibility of friction, as when R.A.F. berth a ship or when a ship with mixed passengers has Army O.C. Troops. The journey to and from transit camps, being made under the direction of Movement Control, a branch of R.S. & T.S., documentation will be simplified as all units will use common vouchers and pro-formæ. (Similarly, in the shipment of stores the same service will be responsible for them from dump to ship and from ship to dump.) Being both consignor and consignee, no misunderstandings of Services markings will arise. The detachments referred to above (under Routine Flow) will be attached to the Port Commandants' staffs; the latter will all be R.S. & T.S. personnel, and in conjunction with commercial agents, naval operations, etc., will allot cargo and troop space, call forward stores and troops, and in reverse clear the ports. Transit camps will be assigned to ports under the control of the Port Commandant, solely for the purpose of housing troops on sea moves; and transit sheds will also be maintained for stores. Large transit camp and sheds should not prove necessary for air moves, but accommodation will be maintained at Staging Posts pro rata to their places *en route*. Staging Posts will be operationally controlled by Transport Command of the R.A.F. but administered by R.S. & T.S. Land moves, under direction of Movement Control, will more usually be of units moving to or out of Transit Camps in own transport, and when in such camps they will have own internal administration in allotted areas. O.C. Transit Camps will be R.S. & T.S. officers, responsible for assembly of drafts of individuals, their documentation, discipline, and despatch, and overall administration.

4. Barracks and Camps

The R.S. & T.S. will be fully responsible for the siting (within the limits set by strategical requirements) of all static units of all four Services, and for any and all constructions of buildings, boundaries, roads, drains, furnaces, water towers, storage tanks and parade grounds. Also for the maintenance of all camps, barracks, posts, stations, and airfields. Service personnel (classed as technicians, on lines of R.A.F. works squadrons) will carry out these services, and the obtaining, holding and issue of necessary material will be under R.S. & T.S. stores procedure.

Works areas, based on spheres of 2nd Echelon units, will be laid down with H.Qs. at operational depots. These areas will have mobile works companies, and static platoons at airfields, naval shore establishments, barracks, etc.

3.—ADMINISTRATION

General

This service will have its own Minister, junior to the other service Ministers; but beyond his personal staff the whole of the personnel will be serving men. The Headquarters will be known as the Directorate-General of Service Supply and Transport, and the Director-General will be the senior officer of the Service. He will have three personal advisers, one from each fighting Service, who will each have a liaison staff. Under the Directorate-General will be Directorates of:

(*a*) Contract Supply.
(*b*) Operational Supply.
(*c*) Movements.
(*d*) Equipment Disposal.
(*e*) Civilian Repair.
(*f*) Service Repair.
(*g*) Manning.
(*h*) Administration and Organization.

These Directorates will have branches such as Pay and Stores Accounting under Administration and Organization, Training under Manning, major ports.

Establishments

The Directors and Commanding Officers of base depots will be officers of general rank. Commanding Officers of operational depots may also be of this rank if the number and scope of the units under their supply control justifies it. Area Movement Control Officers will be of general rank, as also will be Port Commandants of ports.

Field rank will be held by Commanding Officers of Maintenance and stores parks, transit camps, staging posts, minor ports, and by district Movement Control Officers.

Discipline and Internal Administration

The discipline and internal administration of all R.S. & T.S. units will be the responsibility of staff posted for those duties, selected either during initial training or else junior ranks gaining experience (see Section 4). Policing and guards at home stations will be done by wardens, on the same lines as the Air Ministry Constabulary. Overseas, these duties will be performed by Service personnel, with a sub-trade for that purpose. The standard of mental discipline and of education will be kept very high, and regimental parades, etc., will be held as required, to inculcate service pride, military bearing, and correct reaction to orders.

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Pay Accounting

The Service will be self-accounting for pay, with own rates of pay and with appropriate service allowances as laid down by Parliament or by King's Regulations.

Operational Administration

Strategical.—The strategy of the Service will be laid down by the Director-General, after consultation with the three fighting Services, and will be held to include the siting and maintaining of base and operational depots. Overseas, a Deputy Director-General will be appointed in time of war to act in this capacity. The establishment of maintenance and stores parks, and the allotment to them of units; the siting of, and the control of, staging posts, transit camps, and the lines of communication, are to be considered matters of strategy.

Tactical.—Tactical administration will be the organization of lines of communication outward from operational depots, and the functional control of maintenance and stores parks. This will be the responsibility of Officers Commanding depots in each area, in agreement with the commanders engaged or in position.

Stores Accounting

The stores accounting system of this Service will be universal, and common to all units. The best features of existing systems will be included. Ledgers, inventories and vouchers will be designed to enable maintenance and posting to be understood and carried out throughout the Service, whether serving the Army, the Navy, or Air Force, and whether raised by base or forward units. One comprehensive price vocabulary will be used. All contractors' accounts and bills for local purchases and services will be settled by R.S. & T.S., who will either pay direct or authorize payment by unit imprest holder. The Service will have no supervisory powers over inventories of operational units, who will continue with normal service procedure. R.S. & T.S. vouchers used to draw, return, and exchange equipment will be designed for posting to such inventories. These latter will serve as domestic check against entitlement and as a means of assigning responsibility for specific items. R.S. & T.S. detachment officers in operational units will keep tally cards, and these will show a balance issued when applicable (*i.e.*, to inventory items) by subtraction of returns from issues. Commanding officers of units of fighting Services will be given local purchasing powers pro rata to the type, size and functions of the command. Commanding Officers of R.S. & T.S. units will have such powers based on their locality. Purchases of either goods or services will not be made by fighting units until the relative maintenance and stores park has certified their necessity. The placing of contracts for initial supply and subsequent replacements will be the responsibility of M.P.O., who will also scrutinise, and pay, accounts arising from work passed to civilian firms by base and operational workshops. No salvage or surplus stores will be disposed of by a lesser unit than a base depot unless M.P.O. have ruled general disposal throughout the Service, and then only when M.P.O. have scrutinized the tenders. Exception may be made when cost of transport to base may be offset by an attractive local offer, but M.P.O. prior authority must be obtained. No vote adjustment will be necessary between the Services. Payment for hired or requisitioned premises will be made by R.S. & T.S., and no hiring will be made without prior authority of accounting unit. This also applies to land and transport. Camp and unit tailors will be under control of R.S. & T.S., whether they are civilian tenants of camp premises, contractors, or Service personnel. Where necessary (*i.e.*, in base depots) stores accounting sections will be operated. These sections will maintain the master records and ledgers; on maintenance and stores parks, the tally card only being kept, storekeepers will maintain their own records. Transport records will be kept throughout the Service, to be a basis when necessary for costing and charging. In the case of operational units, the officer or N.C.O. i/c will conform to the requests of maintenance and stores parks as to amount of detail required.

4.—PERSONNEL

Trades

The fourth arm should have trade groups for other ranks to be filled by personnel suitable both by reason of capabilities and training. These trades will be:

Storekeepers, to include shipping, road and rail storage experts.

Clerks, to include pay and stores accounting and checkers.

Technicians, to include machinists, fitters, etc.

Drivers, to include motor-cyclists, mates, and crews of large transporters.

Police, overseas only.

Each trade will have grades, determined by necessary specialist training required. Personnel will, in all cases, be graded after such training, and will be paid for duty served in such grades. Officers will not have such grades or grading but will draw pay additional to basic rate for qualifications gained.

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Officers

Entry.—The minimum age for a direct entry will be 21 and the maximum 30. Transfers from fighting Services will be accepted, subject to recommendation and five years previous service, between the ages of 23 and 35. Other Ranks will be considered from commissions after ten years' service, up to age of 40. An entrance examination will be taken by all direct entrants; no civilian equivalent will be recognized, but educational institutions will have access to the papers and be in a position to prepare candidates. Transferees will be excused this examination, but will have to have recommendations for promotion in two previous confidential reports. Other ranks will sit modified examinations at conclusion of O.C.T.U. course.

Training.—All direct entry officers will receive a full initial training in administration, discipline, general accounting, and military subjects. A full knowledge of weapons and warfare will be arrived at, and a working grasp of field engineering. This training will be undertaken over a period of two and a half years immediately following commissioning, and be interspersed with periods of attachments to units as junior officers for general duties. Transferees will be excused such of this training as they are judged to have undertaken in their previous duties, but they will be required to take those courses necessary to bring them into line with officers of R.S. & T.S. Other ranks will normally require only modified courses, and their periods of training should be complete in eighteen months. This initial training must be satisfactorily completed before promotion to equivalent rank of captain is considered, and promotion to full lieutenant will be dependent on progress during training. After completing this initial training, officers will be directed to such specialist training as they may be fitted for, or desirous of taking. This will include higher administration, staff and commanders' courses, engineering courses, and also psychology and works efficiency lectures.

Specialization.—Officers below the rank of captain will not hold specialist posts, but be employed in the general running of depots and L. of C., with frequent postings and changes of duty. Upon any officer displaying specialist ability, or if at the time he completes his initial training he possesses specialist qualifications, he will be posted for such duties as these qualifications indicate and subsequent promotion will depend on his efficiency in these duties. Officers selected for commanders' courses will not necessarily be such specialists, since the post of C.O. of even a base depot would call for more administration and organization ability than technical knowledge, but such officers will be encouraged to take elementary courses, and their doing so will have a bearing on appointment to command.

Powers and Duties.—The disciplinary powers of officers will follow normal service practice; their duties will comprise all planning and executive functions, and the possession of specialist qualifications will not relieve any officer of his administrative responsibilities.

Other Ranks

Entry.—This will be by direct enlistment only, between the ages of 18 and 30.

Training.—A six-months' initial, physical and general training, to include elementary administration and procedure, will be followed by eighteen months of non-technical duties, during which period personnel will provide fatigues but also assist qualified tradesmen for at least half of the time. Technical training in suitable trades will follow. No promotion above that of private, 1st Class, will normally be made until end of technical training, but recommendation for immediate promotion on passing out will be made in exceptional cases. Subsequent technical training, by advanced courses, will be encouraged, and promotion to and beyond staff-sergeant will, in all trades, be dependent on this.

Specialization.—Other ranks will not specialise in any trade before taking technical training. This preliminary is intended to ensure a clear knowledge of all trades in all ranks to give C.Os. a picture of men's reactions in all conditions. After such training, men will be posted for and undertake duties for which they have shown aptitude and preference.

5.—RELATIONS WITH OTHER SERVICES

General

The R.S. & T.S. will be regarded as junior to the three fighting Services and will be subordinate to them operationally. Officers and N.C.Os. will rank with but after those of equivalent status in the other Services. This does not affect the strategical and tactical functions of the Director-General or of officers commanding depots, but their planning will place the actual functions of R.S. & T.S. (see Section 1, para. 2, ii and iii) before its domestic needs.

The Army

Since the R.S. & T.S. replaces the R.A.S.C. and the R.A.O.C., relations should be easy if the new service is regarded as an amalgamation of these two Corps with Movement Control added and part of R.E.M.E. functions also. Relief should be felt at the ability to have L. of C. in the hands

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of experts who can give expert decisions as from a responsible service, and not from a possibly junior officer in same service. The presence of an R.S. & T.S. detachment in a battery, battalion or squadron means no more personnel, since they replace those soldiers normally established to carry out quartermaster duties. In fact, the C.O. will feel that his supplies are in the hands of experts, in direct contact with their source, and he will have less worry than if possibly uninterested soldiers were carrying out those duties. Such detachments will be under the domestic administration and discipline of units to which they are attached, and will be paid and rationed by them. Personnel will conform to all regulations laid down by Provost Marshals.

The Navy

A sharper demarcation will be made between the responsibilities of R.S. & T.S. and the Navy. It is not proposed that storekeeping detachments will serve afloat or in naval shore establishments. Naval stores documents will be brought into line with R.S. & T.S., but will be prepared and presented by naval personnel, who will continue to store and issue under naval procedure. All ships and establishments will be allocated to 2nd or 3rd Echelon units as is convenient for supply. The R.S. & T.S. will operate all transport for movement of personnel and equipment outside the bounds of shore establishments, and inside them if direct to ship's side. Transport platoons will therefore be attached to such establishments. The erection and maintenance of all shore bases will be R.S. & T.S. responsibility, as they will have greater resources at immediate disposal in Works Areas; and the arrangements for supply to operational formations, transport and works services will relieve the Navy of necessity to assign seamen to such tasks, and of any need to control large land depots. Naval workshops will be manned by R.S. & T.S. technicians, with naval engineering staff to advise and to supervise tests. The domestic administration and disciplinary control of detachments will be naval.

The Royal Air Force

Relations with the R.A.F. will be very similar to those with the Army. The R.S. & T.S. will not, however, handle in its workshops air-frame or aero-engine repairs. These will continue to be effected by R.A.F. personnel, with their peculiar knowledge and training. The R.A.F. will, however be relieved of M.T. repairs and maintenance, and of L. of C. problems.

Air Force formations will have detachments of R.S. & T.S. personnel on same lines as batteries and battalions. In the case of A.M.E.S.'s and other similar small units that would hardly justify a detachment, one or two men would be able to handle all the work, as at present is done by one or two equipment assistants.

The Ministry of War Transport

It is proposed that at threat or commencement of hostilities the R.S. & T.S. will have power to take over control of such civilian transport firms as may be necessary to maintain flow of supply between contractors and base depots, and that service road transport and/or rail arrangements will be used outward from and inward to base depots. It should not therefore prove necessary to have any dealings with M.O.W.T. for land movement, nor, of course, for air. The system is not so rigidly outlined as to preclude service transport from working between base depots and contractors, or civilian requisitioned vehicles handling loads to service units, if either course is economical in individual cases. But the divorcing of the movement of service equipment after its manufacture from the movement of raw materials, should leave both responsible departments with a clear picture of needs and available transport. In the case of imports of raw materials for specifically service manufactures, their movement from the docks to factories would be a matter for arrangement with the M.O.W.T. and Ministry of Supply.

Liaison

In all cases where at all useful, liaison officers, briefed by the Director-General's personal advisers from the fighting Services, will be at R.S. & T.S. units to give advice, take note of problems, and ensure close and harmonious relations between their parent Services and the new force.

6.—DEFENCE

General

As shown under Section 4, all ranks will have sufficient military training in the care of arms and of elementary movement, deployment, etc. . . ., to be able to take part, if necessary, in active fighting. This training will be supplemented by refresher courses to keep up to date, and by the internal defence organization of units.

Small Arms

All ranks of all trades will have small arms established. These will not be held by personnel, though on personal allocation, except when performing guard duties, during courses, or in actual emergency. When not so held they will be held in unit armouries; when issued they will be maintained by personnel. Arms will be allocated on entry into service and remain on charge throughout service, except on change of scale, so ensuring feeling of ownership.

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Automatic Weapons

Light machine guns and mortars of P.I.A.T. type will be established on all units, for defence against air strafing and armoured break-throughs. Transport convoys will, if at all practicable, have one or more trucks with light guns of 20 mm. type mounted, or with machine guns on cab roofs for anti-aircraft defence.

Personnel

It is not proposed that personnel should be established solely for defence purposes, but that weapons should be manned by technicians, etc., if necessary.

A.R.P. and P.A.D. Training

All units will keep strictly up to date with their A.R.P. and P.A.D. training and organizations, and such shelters, first-aid posts, and decontamination quarters as changing methods of attack make essential, will be erected by the works detachments.

7.—MEDICAL

Units

The R.A.M.C. will be responsible for all medical quarters and services on R.S. & T.S. units, unless the geographical position places such a unit far from an army hospital and near either an air force or naval one. If in such a case the R.A.M.C. decide that better major service would result, a detachment of medical personnel from the nearest hospital will be attached to the R.S. & T.S.

Detachments

These will be fully under the medical supervision of service to whom attached, and the latter will be responsible for all necessary treatment, reports and documentation.

First Aid

Every effort will be made to have all ranks trained in elementary first aid, and for advanced first-aid training to be available. Small pay bonuses will be granted to those who pass the standard set for voluntary study.

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REMINISCENCES

(*Continued from page* 134, *Vol.* 18, *No.* 2)

By Wing Commander D. L. Allen, R.A.F. (*retired*)

No. 2.—FLYING TRAINING, 1912

JOHN SALMOND climbed into the pilot's seat of Aircraft No. 9 and fastened his lap-strap. His instructor gave him his directions: "Take ze bus across ze aerodrome as we have already done. Do not go too high. When you wish to come down, swish off—swish on. Allez, mon enfant!"

Louis Noel frequently addressed his pupils as "Mon enfant." "He is my pupil, naturally I call 'im mon enfant."

The pupils were some ten or twelve young men learning to fly at the Graham White School at Hendon; a mixed bag, amongst whom were some young soldiers hoping for secondment from their units to the recently formed Royal Flying Corps. In those days, young officers who aspired to that gallant Corps had as a first step to qualify, at a cost of some £75 to themselves, for the International Flying Certificate or *Brévèt* as it was usually called.

Flying instruction began with straight flights at a height of about 40 feet across the aerodrome, the pupil sitting behind his instructor and reaching across the latter's shoulder so as to get the feel of the control. In due course the instructor changed places with his pupil until the latter was ready for that great event in every flying career, the first solo.

It was upon this adventure that Salmond was about to embark. Knowing what was in store he had earlier that evening, in company with the other pupils, driven the cattle that grazed the alighting area well into a distant corner. This was the usual procedure, and Louis Noel, with Gallic lightheartedness, used to vary the appellation of his pupils from "Mon enfant" to "Coo-boy," and John Salmond, as the senior pupil, was the "Foreman of Coo-boys."

"Switch on!" called the mechanic, for it was before the days of "Contact." "On!" repeated Salmond. The propellor was swung and the Gnome engine came to life with all the force of its 50 h.p. No. 9, gathering speed, eventually staggered into the air. The aircraft flew fairly steadily across the Hendon aerodrome and landed intact on the far side. The pilot had manipulated his flying controls correctly, and successfully decreased speed by switching his engine off and on, for the Gnome engine of those days ran only on full throttle.

Continuing to "swish off, swish on," the pilot turned his aircraft and No. 9 was soon in the air again on the return journey. This time things did not seem to be going quite so happily and the uncertain movements of the elevators aroused forebodings in the minds of the watching instructor and pupils. They were not mistaken, for No. 9, with engine still at full throttle, suddenly headed for the ground. Disaster was averted at the last moment by the pilot, for he switched off and gave his elevator control a despairing jerk. As he climbed down to examine the damaged undercarriage, Louis Noel and some pupils came running up. A glance showed that there would be no further instruction that evening or early next morning, for there was no alternative aircraft.

Louis Noel turned on the erring soloist.

"You are a stubborn pupil! I say 'swish off, swish on.' You come down full moteur. You break ze bus; you keel yourself. Oh, damn it all!"

An apologetic growl from Salmond was cut short by staccato ejaculations, uttered with crushing finality—"Foreman deesmeesed, Coo-boy no good—Sheep-boy!"

Whilst the other pupils with the prospect of an unexpected Europe morning before them discussed a run up to the West End, Salmond walked away musing. His first solo had hardly been a success. He smiled sardonically at his dismissal from office, for Louis Noel was really a very good fellow and a good instructor. Yes, he would master "swish off, swish on" and the other problems attendant upon this flying business.

Later he did, and to some effect, for he became a Marshal of the Royal Air Force.

No. 3.—AIR RECONNAISSANCE, 1914

MONS

On 22nd August, 1914, the Royal Flying Corps in the field, comprising some forty-three aircraft, was based at Maubeuge on the Franco-Belgian frontier well in advance of the main body of the British Expeditionary Force. The Battle of the Frontiers was developing, and as liaison with General Lanrezac's Army was none too good, Lieut. P. B. Joubert-de-la-Ferté and Alan were sent on reconnaissance in an 80 h.p. Gnome Blériot monoplane to see how things were going with the French on our right front. As the aircraft flew at heights varying between 1,500 and

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2,000 feet practically all movement on the ground was visible and it was before the days when concealment from the air became a fine art. As they flew over the battle which the French were fighting in and around Charleroi it became evident to Joubert and Alan that our Allies were being driven back. There were all the signs of a general movement to the rear. Their report was coldly received upon landing, for the Intelligence Staff felt certain that our liaison officers with the French could not fail to report such a movement, and no such report was to hand. So nothing was done to stay the "forward" march of the British Army, and that evening the First Division marched through Maubeuge towards Mons. The population turned out *en masse* to welcome the troops and enthusiasm reached its climax when the Grande Rue reverberated to the combination of the cheers of the crowds and "The Irish Whisper" of the Royal Munster Fusiliers as their drums played them through to the strains of "Brian-Boru."

So the British marched forward to fight at Mons next day, not knowing that their right flank was in the air. History shows that our forces were committed to battle before confirmatory information of the French retirement reached G.H.Q. As the action at Mons began the R.F.C. hurriedly pulled out from Maubeuge, the transport quite expecting to meet Uhlan patrols.

Le Cateau, 26th August, 1914

The Retreat from Mons was in full swing, and British G.H.Q. and the R.F.C. were at St. Quentin. Our Second Corps, unable to disengage without fighting, was being heavily attacked by four German Corps on the line Cambrai—Le Cateau. At about 2 p.m. G.H.Q. wanted to know how the battle was going, so Lieut. Vivian Wadham and Alan were sent to see and report. For an hour and more they flew over the battle, the pattern of which was clearly discernible. Alan watched the withdrawal of some British guns, the crews of which had all been killed or wounded. Salvos of enemy shrapnel burst continuously on the relief teams as they galloped up, and when the smoke cleared the groups of wounded horses struggling panic-stricken on the ground could be discerned. But at last some of those guns were got away, a feat for which several Victoria Crosses were subsequently awarded. In vain, Alan dropped a message pin-pointing a concentration of hundreds of German horses, the teams of a Field Artillery Regiment, the guns of which in perfect alignment were causing havoc and destruction amongst some guns of our 5th Division as they withdrew. The general retirement along our whole line could be seen, with officers rallying and re-forming the infantrymen as they streamed back over the fields.

The bearer of ill news is never welcome at a Military Headquarters, but it is significant of the rapid growth of the prestige of R.F.C. reconaissance that Alan was taken to see personally the Chief of the General Staff and the Head of the Intelligence Branch.

Alan returned to the aerodrome to see a heavy thunderstorm coming up, and the aircraft hurriedly flying off southwards and right into it. In wind and rain the transport continued the retreat. Late that night when the convoy laagered on the roadside, Major Barrington-Kennett, of R.F.C. Headquarters, came squelching along in the mud outwardly breathing an air of cheerfulness. Quietly he told Alan in confidence that at the moment Headquarters could account for only four of our aircraft; he hoped others would turn up in the morning.

It was indeed the nadir of the fortunes of the Royal Flying Corps.

The Marne, September, 1914

The British Forces were south of Paris, but at length the heretofore endless retreat seemed to have been halted, for some units had actually been stationary for twenty-four hours. The High Command were, however, very uneasy, for although the pressure from Von. Klück's pursuing army seemed to be relaxing, the German Cavalry Corps had been unaccounted for for two days. Widespread air reconnaissance had failed to discover their whereabouts. Hence the misgivings in high quarters where nerves had become very frayed. Lieut. Philip Joubert-de-la-Ferté and Alan were one of the reconnaissances sent out that evening to try and clear up the mystery. On the right front of the B.E.F., groups of German infantry of about company strength were seen moving southwards on parallel roads and then taking up picket lines. These advanced guards seemed weak for the numerous divisions believed to be behind them. And where were the serried ranks of marching infantry, the long columns of horse-drawn artillery, the endless supply trains? They were there all right, but not where Philip and Alan expected to find them. As darkness fell, thousands of bivouac fires seemed to burst into flame, and of a sudden the picture became clear. The axis of the enemy advance was eastwards, not southwards towards the British. Just as Alan finished marking the main concentration of fires on his map, they both suddenly made the same discovery—that around a group of ponds there were watering parties of horses so numerous and crowded that they could indi-

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Comic Relief for Staff Pilots

By E. F. Davis

WE were a happy little company of staff pilots peacefully getting on with the job in Prince Edward Island, but we should have been much happier if it hadn't been for submarines. Enemy ones, that is. During the spring and summer of 1943 they took a steady toll of shipping in the Gulf of St. Lawrence, and Eastern Air Command, taxed with the shortage of operational Coastal aircraft in Canada, now looked about for means of extending anti-submarine patrols.

The eye fell upon us.

Our job up to that moment had been the training of Coastal pilots and observers in G.R. We were No. 1 G.R. School and our neighbour at Charlottetown was No. 31. Don't ask me where the other twenty-nine were: I never did find out. We were, as I have indicated, a shy, retiring lot.

You can imagine with what feelings we awaited our conversion to war. We flew Ansons, *Mks. I* and *II*, and very lady-like jobs they were, especially the *I's*, which had done a lot of flying and knew their way about the air much better than we did. You know the sort of thing. You pat the engine cowling in a figurative sort of way, take your feet off the rudder and Aggie takes you back to base every time. I shouldn't wonder if we had the prototype *Mk. I* in "B" Flight at that time, an ancient indestructible old girl who must have seen some engine log-books in her time. Her windscreen began about a foot in front of the instrument panel. I'm not sure whether she wasn't built in the days *before* instrument panels, in that glorious age (if one believed the Regular types) when the Turn and Bank Indicator was a piece of string suspended from the roof with a weight at the end, and the Artificial Horizon was a jar of water with a line painted round the outside. No aerobatics in those days, obviously.

But I digress: I did mean to tell you how they made us into sub-hunters. I wish you had seen the vintage armament we got. They were depth charges, *naval pistols* in official language, 250-pounders. I don't know where they came from, but they looked rather as if they had been left over from some previous disturbance; like Trafalgar, for instance. The armourers went silent if you talked much about them, and we soon stopped asking questions, but it shook me when I saw my Anson sporting two of them hung side by side externally, below the bomb racks.

Runways are long, but life is short, as the chap said when he landed downwind, and 500 extra pounds seemed a lot for an Anson, not counting the drag. Still, orders were orders.

I don't remember being particularly talkative at lunch that day, but words failed me altogether when we learned that Bill Darby, "W.D." as he was known, and I, in virtue of our age and excellence had been elected to carry out the first dawn patrol next morning, with a take-off time somewhere around the cheerful hour of 0330. It was summer, fortunately, but we had done no recent night flying and first light was not until about 0500. In fact, the whole object of our early start was to enable us to be at the limit of our patrols by dawn. And the limits of our patrols were two positions (thoughtfully marked X on Operations Maps) where submarines had that day been reported. For those familiar with the terrain, one patrol went north-east beyond the Magdalen Islands and the other north-west towards Anticosti.

Maurice Musgrave, our Flight Commander, gave us a short pep-talk in the afternoon. Press on, you know, you lucky people; then confidential odd points about our terror weapons. Release them at nought feet; that seemed to be the main thing, for they were timed to explode by water pressure at twenty-five feet below the surface. That was all. No word about what the submarine was supposed to be doing meantime.

But we had seen reports of fights to the death in the Bay and .5's and Oerlikons were firing away in our heads. I won't say we felt as heroic as we hoped we looked by bedtime. "W. D." and I were room mates and consoled each other. At least we were both mixed up in it together and a submarine or two to our credit would enhance the reputation of the old firm. It was rumoured that anyone who even damaged one would qualify for an "Immediate Award." We went off to sleep bowed beneath the weight of hypothetical gongs. As a matter of fact "W.D." already had an E.G.M. which he got as a despatch rider with the Army in the retreat to Dunkirk. He blew up a bridge under enemy fire. We had no difficulty in imagining that either, for he was a turbulent little man who looked fit to blow up anything.

Things didn't look so hot at dawn, when we taxied out to take off. I was never at my best at this hour, but "W.D.," even slower in the uptake that morning, got himself off first, and we watched with infinite satisfaction when he finally trundled into the air. We had a staff W./Op. and two pupil navigators. "Jackson," my regular W./Op., wasn't with us that morning. I don't know why. Perhaps it was too early for him. But Billy Fedoruk, I remember,

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was in his place, and two Saskatchewan pilots—acting navigators—made up the party.

We were soon airborne into a thin mist at a hundred feet, and then, climbing to four thousand, headed out along our patrol line. We had drawn the Anticosti sweep, and parted company from Darby's outfit almost immediately. Looking back on it now, I realize we were really dead keen. As dawn came we began to see submarines in every wave-cap, and after no end of dummy "sightings" (real C.C. types will sympathize here) we finally came above Bonaventure Island which lay almost at the limit of our patrol. And behind it, so help me, was the wake of a submarine which had just gone down for the third time.

I knew it was far too late as we hurtled down to sea level and dropped our lot. We may have shaken them up a little, but as we circled round afterwards looking greedily for bodies in the still seething water, and nothing appeared, we decided to head back for home. We had pushed out a "sighting" and an "attack" report (no loud laughter, please) and still felt as if we had had a good morning.

Then I saw that the extra weight of depth charges, coupled with my high-powered steep turns over the scene of the crime, had cost us more petrol than we had bargained for. The aerodrome at Chatham, New Brunswick, was a little nearer: we would go there.

So, with the fuel gauges reading zero, we popped in there comfortably enough. There was a real live flight of Reconnaissance Hudsons at Chatham which looked like big stuff to us, and the Operations' Room listened eagerly to my tale. I was casual as anything, but was glad to see a couple of crews waiting dressed and ready to go out and investigate. Then we had a leisurely breakfast, refuelled, and set off for home in time for lunch.

We didn't exactly expect a heroes' welcome, but we were ill-prepared for the grins and smirks which greeted us. Canadian ground staff (bless 'em) have a humour peculiarly their own. "I guess you sure scared hell out of them whales," said Slim, a lanky engine-fitter, and "Bet these pore b——s in Quebec won't go fishing for a long time now," drawled another. Smiles for my story in the Ops. Room: open laughter in the Mess. I couldn't understand it.

Then I saw Willie Darby in the centre of a convulsive group of sergeants. Apparently he had sighted the biggest flock of submarines in captivity off the Magdalens, and didn't realize in the poor light that they were in fact only whales until he was right on top of them. He had no wish to vent his disappointment by blowing them up, but, realizing that he couldn't get back against a southerly wind with his wretched depth charges up, and curious to see whether "the damn things really worked," he had dropped them near enough the harmless convoy to waken them up. The antics which followed as the nervous animals capered all over the Gulf were no doubt funny enough, but he didn't realize that by getting back ahead of me with such a story he had completely queered my pitch. We were room mates, remember. It wasn't long before we were being quoted as having agreed the previous night to drop our depth charges whether we saw anything or not. Maurice Musgrave shook his head sadly over us, seeing a joke which, so far as I was concerned, simply wasn't there.

Soon I gave up even trying to stick to my story—it was not to be believed. The Hudson which had searched from Chatham found nothing. And so to this day no one except Billy Fedoruk and these two navigators know how close we came to getting a submarine—or the *chop*—in the Gulf of St. Lawrence at first light on 19th May, 1943.

I have always felt vaguely cheated over that. With an Anson, too. Wouldn't it have been a wizard line?

(*Continued from page* 169)

cate the presence of only one force—the missing German cavalry corps. Confirmation was readily forthcoming, for flying low in the failing light the occupants of the aircraft could discern horses watering at every stream, and horse lines crowded round every farmhouse.

The full interpretation of the picture was now evident. Von Klück, ignoring the B.E.F. to his south, had turned east to help the hard pressed German Armies on his left. The Cavalry Corps, moving undiscovered across the front of the B.E.F., had taken up their orthodox position in the van of Von Klück's movement.

That night the accuracy of the R.F.C. Reconnaissance was not questioned. Next day the British, now advancing, fell upon the rear of Von Klück's army, thus making their first contribution to the "Miracle of the Marne."

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OUR GALLANT ALLIES

By Wing Commander J. C. Millar, D.S.O., R.A.F.

DURING World War II I had the good fortune to serve in many countries and in a variety of appointments. The experience taught me numerous lessons, most of which have already, or soon will be, described by better writers than myself. However, in my varied wartime service I noticed one aspect of warfare for which in peace we appeared to have made little preparation, and in war were forced to learn by our mistakes. This was the art of working in harmony with our allies.

At the outset all was usually serene. Allies met together with flowers, free drinks, and flowery speeches. Then, only too often, the happy wedding feast gave way to suspicion, and suspicion to mistrust and ill-feeling. When troops arrived in a new theatre of war it was "Vive This" and "Bravo That"; after they had stayed awhile it was complaints and grumbling. Thus it was in relations with the people, and so it was too among serving officers. I am not painting a gloomy picture, or trying to make out that relations with our allies were always bad—far from it; they were often excellent, but they were not as good as they could have been, and often went through a painful phase before real understanding and co-operation were achieved. All who worked closely with our allies have come away with real friendships, and considering the variety of nations described as united, a remarkable degree of co-operation was achieved. What prompted me to write this article was a desire to record what I think were some of the causes of the friction which did arise between allies, and to suggest ways in which they may be avoided in future.

The greatest single impediment to good understanding between allies can be the lack of a common language. I well remember an occasion in 1939 when a squadron had just arrived in France. A captain of a neighbouring French unit visited our adjutant. The captain's English was unintelligible though persistent, while the adjutant had little or no French. After a quarter of an hour each had lost his temper, for the adjutant was under the impression that the captain had come to evict the squadron from their comfortable chateau, while the captain's assumption was only too plain from his gestures—the English were even madder than he had been led to believe. This was hardly surprising, as the object of his call was to pay his respects to the C.O. and offer any help in his power. Just as he was about to leave an interpreter arrived, all was made clear, and the Entente was once more cordiale. On another occasion the Mess Sergeant turned out what he took to be a spy, and who was actually the distinguished manager of a well-known firm of champagne merchants who had come to offer the Mess good terms and some very good wine. I think the lesson to be learnt from the language question is that unless one is fluent it is advisable to use an interpreter when discussing official matters. Serious misunderstandings can arise from imperfect understanding of language.

When America entered the war there were many who thought—at last we have an ally who speaks the same language. This was a dangerous supposition, for American is now a distinct form of English. Most of us have learnt to understand it fairly well from films, but we cannot speak it. The Americans, on the other hand, can only speak their form of English and often cannot understand ours. Thus, unless an Englishman takes pains to make himself abundantly clear, there is a real danger of misunderstanding.

It is natural to be suspicious of foreigners. After all it was not so long ago that in some Yorkshire villages they threw stones at strangers—just to discourage them. During World War II a senior R.A.F. officer attached to the Turkish Staff College in Ankara was arrested by a sentry on his way to deliver a lecture—the reason given was that he looked suspicious. In the face of suspicion it is usual to meet together over food and drink, and then both sides exchange ideas and find points of common interest and purpose. This has its dangers. Both come away saying what good fellows the others are and how really alike they all are, and it is not until difficulties have to be faced that it is discovered, too late, that the differences have been overlooked and are as misleading as ever. It is appreciating differences, rather than finding common ground, which leads to good co-operation. Again, this is very true of our working with Americans, where so many Englishmen see the common characteristics, but fail to notice the fundamental differences.

During World War II we in England experienced for the first time the strain of having a foreign army billeted in our country, an experience which is by no means new to continental nations. In World War I the French had a song which began, "Quand la Guerre est fini, les Anglais partis . . ." One cannot help feeling that the second desire was very close to the first. With the best goodwill on both sides, the position of the stranger within the gates is still difficult, particularly if he should have more money to spend than the inhabitants. In France, in 1939, we noted with pride how well our airmen got on with the

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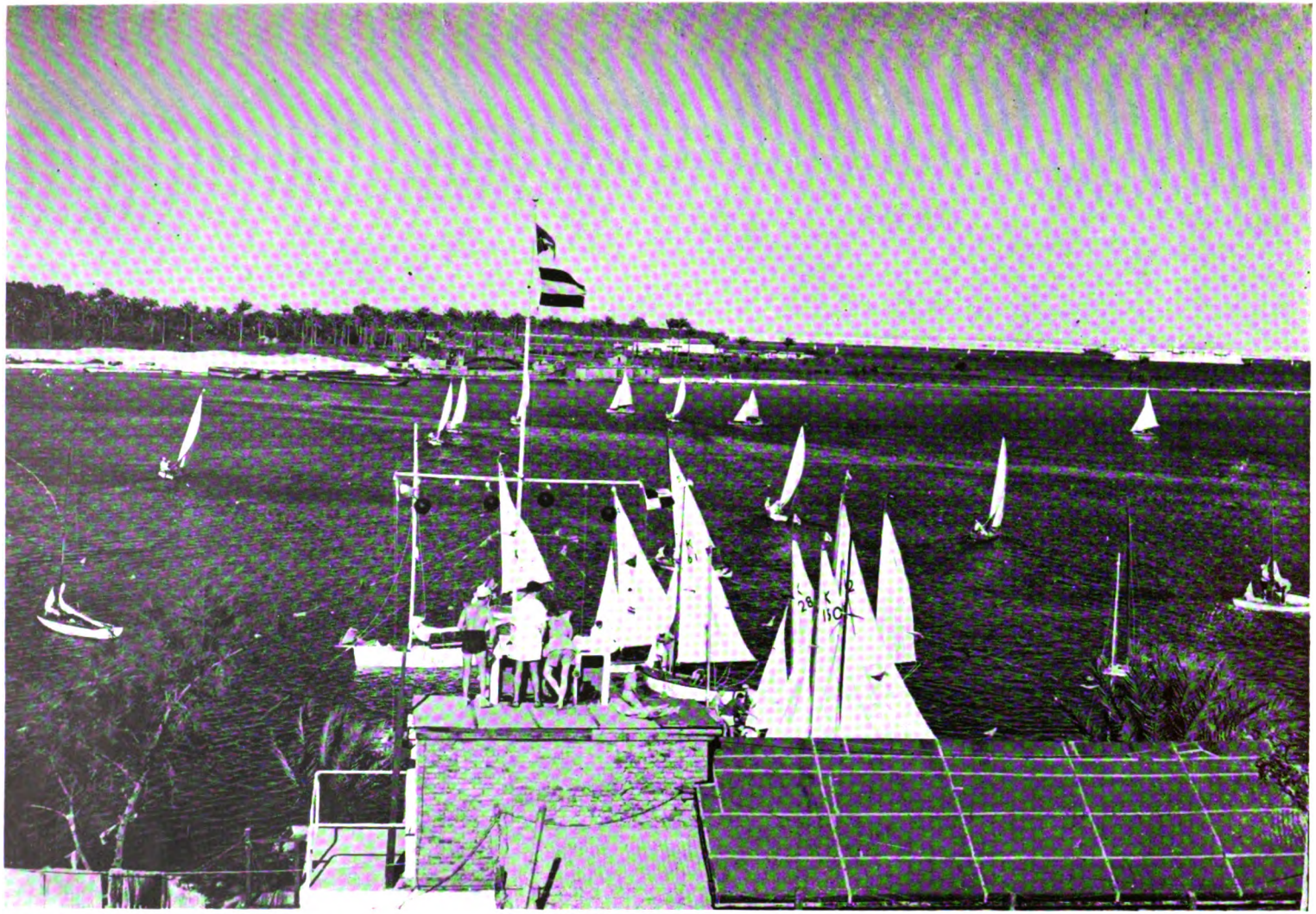

R.A.F. Yacht Club, Ismalia

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Start of a Sailing Race, Mouscar

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French girls; later at home we were to see the reason only too plainly.

Money is one source of friction between forces overseas and the local inhabitants, and another is that irresponsibility common to nearly all tourists. How many Englishmen, or other peoples, have excused behaviour which they would never have dared at home by, "What does it matter; we're abroad now"? I think the lesson to be learnt is that all ranks serving in an allied country should receive the same scale of pay as the local forces, the balance, if any, being retained for them at home, and that all officers and men must be made to realize that higher standards of behaviour are called for when overseas than when at home.

Military history shows that the enemy will often strike at the junction between two allied armies in the field as the weakest part of the line. As it was in the field, so it is behind the lines in modern warfare. Propaganda is now a powerful weapon. Much of its force is aimed at any weak joint between allies, and it is most effective when it is directed at any existing friction. Nearly all our major wars have been fought with allies, and I think it is fair to assume that we may have allies in any future war. It is thus well worth while to study in peace how we can best co-operate with allies in war, and so make the most of our combined efforts to resist the penetration of dangerous enemy propaganda.

Assuming that understanding of differences between ourselves and potential allies is the solution to the problem discussed, it is my opinion that the following should be given serious consideration in peace time:

1. Missions and individual units to be exchanged as often as possible.
2. Some inducement be given to officers to take their leave abroad.
3. Sports fixtures, down to station level, to be arranged with foreign units.
4. The study of suitable countries and their peoples to be made part of the training of all senior officers.

Administration—Sound and Unsound

By Squadron Leader John W. May, D.F.C.

THIS article can hardly pretend to be authoritative in any ultimate sense (if only on account of the youth of the author) but it does embody some hard practical lessons learnt in nearly two years of administrative work in three widely differing appointments in the Royal Air Force.

Paper

I start by dealing with the question of what is variously known as "bumph," "coggage" or "paper-work," because it is generally by people's attitude to and treatment of this subject that one can judge their administrative competence. There are those who condemn all paper-work as unnecessary, and there are those (by no means only Civil Servants) who are continually bogged down in a mire of paper. They are equally bad administrators, working from equally wrong premises.

All administration is a *means* and not an end. In the Royal Air Force the end is, in general terms, to fly and operate aircraft. Within the art of administration paper-work is again a *means* and not the end; this fact must never be forgotten for a single moment. Every single piece of paper, every file, every minute, every return must have its own individual justification. Paper should never be originated or collected to decorate office walls or to make a Registry appear busy (this may sound to be superfluous advice, but from observation I can say that it is nothing of the sort).

Paper-work should be reduced to a minimum consistent with efficient functioning, and what *is* done should be done in a superlative manner, for any office, unit or formation is inevitably judged by the paper which it sends forth. A letter of excellent content, typed badly and untidily set out, is bound to produce an unfavourable reaction in the reader, and he will, perhaps subconsciously, discount its contents. Letters must always be on clean white or cream paper and should always include a typewritten facsimile of the writer's signature and his telephone number (with extension if applicable). All this means training for administrative staffs, both officers and men. We in the Service must realize that there is nothing to be ashamed of in doing our office work well. If it were indeed done better now than it is there would be less opprobium attaching to the epithet "chairborne."

If you are a practising administrator you

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should worship the waste paper basket as a minor deity, and you should propitiate it daily with as large an offering as possible. The best place for any piece of paper is in the W.P.B. and there should be a well-defined reason for keeping any particular piece away from it. Clerical staff should be actively discouraged from putting eight or nine copies of the same enclosure on a file because they don't know what else to do with them. (Yes, it's often done.)

One last point. The telephone should always be used, if possible, to save paper-work. Many, many things are of only passing interest, and it is an absolute waste of time to write letters or minutes about them. The telephone should be used and, if necessary, a note of action can be written on the bottom of the relevant document.

Personnel

It is an old adage that an officer should never give an order that he would not himself be prepared to carry out without question, but unfortunately there seems to be an increasing tendency to honour it in the breach rather than in the observance. One of the objects of commissioning all officers from the ranks is to ensure that they have a real understanding of their subordinates' problems. Many officers appear to forget this and to delight in issuing orders which can do nothing but cause justifiable resentment among their men. Before issuing an order, whether written or spoken, one should always pause to consider what one's reaction would be if one were at the receiving instead of at the transmitting end.

However small or however large one's responsibilities, and however few or however numerous one's staff, it is vitally important that there should be a clear division of responsibilities and that it should be thoroughly understood by all concerned. Nothing is more productive of friction and of wasted effort than overlapping of duties and a general confusion as to who is responsible for the performance of a particular task. It is quite remarkable what an amount of work is delayed in an average administrative unit in the Service because Cpl. "A" thought L.A.C. "B" was doing it while L.A.C. "B" was, of course, equally convinced that Cpl. "A" had finished it the day before yesterday. That is how P.O.Rs. get delayed or are not issued at all; promotion assessments get lost, and so on. The efficiency of the general administration of a unit has a very direct bearing on the efficiency of its operational side. If men feel that their pay, promotion and general welfare are subjects of complete indifference to the administrative staff, they will inevitably slacken up in their own work. It should be remembered that one wrong entry in a P.O.R. may cause endless hardship to a man by adversely affecting his pay or allowances, and it is always much more difficult to put things right again than to put them wrong in the first place. It is the responsibility of any officer in an administrative appointment to keep his clerks and his other staff up to the mark in this respect.

Those who are concerned with the granting and withholding of leave and privileges should be reasonable in the exercise of their power. Justice must not only be done but it must be *seen* to be done. When leave is refused or a privilege is cancelled, a reason should invariably be given. The man has a right to know it, and by being forced to state it one is certain of being clear about it in one's own mind—a salutary precaution against muddled thinking.

There are things that must be done now and things that can be done in two hours' time, but it is sometimes difficult to make one's subordinates realize that the former category has any real existence. Do not be afraid to raise your voice and stamp your foot occasionally—by doing so you will help to dispel the clouds of lethargy which so readily form between four and six feet from the floor in most administrative formations. Done occasionally, it can do no harm and will almost always produce an increase in the general tempo of work.

Statistics and Returns

A cynic once said that there are lies, damned lies and statistics. Like many exaggerated statements this one contains a germ of truth. Statistical study has in many fields led to great advances, but in administrative spheres it has often done no more than produce sterile masses of tables and graphs.

It is most vital that before calling for some new return or statistical analysis one should be quite sure that it is needed and also that the information sought is not *already implicit in some other return.* It must be remembered that time spent by an individual in producing statistical returns means less time for his normal work. It is ridiculous for men to spend so much time compiling returns of the hours spent on the servicing of various types of aircraft that aircraft stand unable to fly for want of men to service them. There is no need to carry this point further, and I wish only to emphasize that here is a sphere of administration where a sense of proportion is even more important than elsewhere.

General

No administrator, however competent, can hope to do all his work himself or even to supervise it all. Therefore he must, from the very first, train his subordinates to have the same ideas as

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himself and ensure that they are guided by the same general administrative principles as he is. If subordinates originate unnecessary correspondence it is just as fatal as if the head of the department had done it himself. It cannot be too often stressed that perfection at the top of a unit or department is quite useless unless backed by a similar competence below. This implies that the conscientious administrator must deliberately devote some of his time to supervision and to surprise checks of the work going on below him. And if something has been done wrong the remedy is not to say "Do better next time" but to have it scrapped at once and done again correctly; then the careless or heedless subordinate will probably remember.

Manpower for administrative purposes must always be cut to an absolute minimum, and for this reason, if for no other, care must be taken to eliminate unnecessary and time-wasting work. The time factor should always be kept in mind and before commencing a job that is going to take some considerable time one *must* consider whether the need will still exist at the time when the project is likely to be completed on a realistic estimate. By ruthlessly eliminating all administrative work of a purely ephemeral character, the possibility of completing really vital work within a reasonable period is obviously enhanced.

Finally, I wish to address two very practical points to all Service administrators:

(*a*) Always aim at doing one day's work at a time. When you leave the office at the end of the day both your "In" and "Out" trays should be empty (and *not* because you have put all the files in the drawers of your desk). Don't maintain a large "Pending" tray. If you are unable to deal with a file, have it brought forward in a methodical fashion in a week's time or whenever you think that you will have the time or additional information or whatever it is you lack at present. Any man can work better and more efficiently at a tidy and relatively empty desk than at one that is cluttered up with old papers and files. This is *not* an unimportant point as some people, I know, will tell you.

(*b*) Use your initiative and common sense all the time and don't be afraid to learn from the best administrative practices of large commercial undertakings (many of them are run very efficiently). Don't initiate shoals of unnecessary correspondence and don't be afraid to terminate a correspondence that has outrun its usefulness by refusing to answer a silly letter; the quest for the last word often involves a great waste of energy.

Aministration does not just happen or even just grow, like Topsy. It requires conscious effort and is just as worthy of study as is any other art or science. Well performed, it can be most rewarding and far from the "bind" that it is still considered by all-too-many people in the R.A.F.

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Navy's own Basic, Applied and Operational training units. Naval air stations and carriers could continue more or less as they are today, except that in the carrier it would be vital that the operational control of aircraft and the training of aircrews be vested in a senior air officer. The captain of the ship must necessarily be a sailor.

Duties at Sea

In a carrier force there should be in the flagship both a sea and air commander. Each to his own job.

As I see it, this scheme has most of the advantages and few of the disadvantages. Amongst the latter might be considered the fact that an air officer would be debarred command of a seagoing ship. What of it! His training and upbringing would have been for the air—his own choice.

There we have it. Sailors should not fly, and aviators should not sail.

Naval Aviation must continue to be an integral part of the Navy—its "better" half. It must have its own specialist off-shoot like any other Service, and, above all, its aircrews must be weaned on oxygen—not on "salthorse."

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The weight of evidence overall was, however, very conclusive, and I will venture to assert that the Squadron and those M.T.Bs. could have operated anywhere against anything with perfect harmony. The idea is not original, of course, and many will say that the F.A.A. has aircraft too. Right enough, but they haven't the miles behind them that G.R. Coastal types have. And so on—ad prang 'em infinitum. You argue it out.

Personally, I'm convinced by experience that a diet of "flying fish" in any Coastal "menu" is absolutely essential for first-class results.

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SHOULD *Sailors* FLY?

A COURSE ESSAY FROM THE EMPIRE FLYING SCHOOL

It must be clearly understood that the writer's opinions are his own and do not necessarily reflect the official viewpoint either of the Admiralty or the Air Ministry

WHAT does the future hold for the Royal Naval officer pilot? Primarily a sailor, or primarily an airman—or a bit of each? Can the post-war naval pilot be trained, and acquire sufficient experience of the air and sea, to be termed truly competent in both? If not, what are the alternatives?

If it is decided that the ultimate function of the naval pilot is to command an aircraft carrier, then his training and upbringing in sea and airmanship must progress on parallel lines. One is as much a profession as the other and deserves equal attention. Not only must he know how to sail his ship, but also, how best to employ, by day and night, its primary weapon. How can this officer, in approximately twenty-five years of dual service, best achieve this dual ability?

War Experience

Let us first consider the experienced war-time pilot who, for seven years, has to all intents and purposes, been divorced from the "Salthorse" Navy. By virtue of this experience he must necessarily form the nucleus of the post-war training scheme. His operational and training qualifications and knowledge must be handed down before he returns to the sea.

This is all very well, but in the meantime what of his career as a seaman? Is it possible that after these further years devoted to aviation, this war-time pilot will be able to renew his acquaintance with seamanship and regain something of what he has missed? And if he does become a sailor and eventually commands a carrier, will he still be flying—if only for his own interest or convenience? If not, he's not our man.

We can leave him here and turn our attention to the post-war pilot—the new material.

Post-War Training

Still considering the original requirement, that of dual air/sea Service training, the course of the post-war officer pilot may be traced as follows:

After approximately seven years' naval training (mainly cadetship) he commences his aviation career. For the next twelve months or so he learns not only to handle an aircraft but also why and how it flies. He learns how to fight it, and, finally, how to operate it from a carrier. His ground instruction is also extensive.

On completion of this training he is appointed to a first-line squadron. If embarked in a carrier he has opportunity to further his nautical experience. After two years we can expect to see him ashore again undergoing a more advanced flying course, followed by a period on an air station in some instructional capacity.

His sea experience in the past five years has been limited to carriers. It would therefore appear desirable that it should be broadened by a commission in a cruiser or destroyer. This being so, in the following two years it is unlikely that he would often see the inside of an aircraft. He is, on the other hand, gaining valuable sea experience, and as a refresher course will soon put him back in flying, these two years can be considered net gain.

. . . sailor, airman, or a bit of both ? . . .

A commission at sea can be followed by two years on an air station or carrier, and so on, until eventually he attains his goal, that is—gets command of a carrier.

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The Pitfall

Recent appointments indicate that the future is intended to be much along these lines. Be this so, then Naval Aviation is due for a very rude awakening if ever called upon to fulfil an important task with insufficient time to train a few pure pilots.

Consider once again the talented officer of dual experience who has risen to command a carrier. To be ideally suited for the job he must

. . . renew his acquaintance with seamanship . . .

at least know as much about the sea as his purely naval counterpart and as much of the air as his R.A.F. equivalent. What then of the less able officer who, in the normal course of events, would have reached a similar position of authority in either one or the other—but not in both? Pause a moment and consider the below average officer—and there must be many. He who would have made a poor sailor and an equally inferior pilot. Endeavour to fill him with the doctrine of both—then what have we?

The pitfall of this dual career is one of divided interest. Sea and air. Our officers are expected to jump from one to the other; to possess dual personalities. It is true that Naval Aviation and the Navy proper have much in common. There are many connecting links. On the other hand, pure seamanship and pure aviation are widely separated. It is not logical to expect the pilot to show equal enthusiasm and ability in both. Phychologically, it is unsound, and in war impracticable.

The post-war naval pilot can no longer be looked upon as a naval officer specializing in flying. There are, after all, as many specialist branches in aviation as there are in the Navy—or any Service. Naval Air played an ever-increasing and more vital role towards the end of the war. It virtually became the Navy's primary offensive weapon. Its members were essentially pilots with little leaning towards the sea.

The question is, how best can the air-potential be moulded to meet the naval requirements of the future? As I see it there are two alternatives.

A Naval Air Command

The first is, that flying be left to those who best understand it. The R.A.F. has the facilities, the aircraft and the general experience. The suggestion is that Naval Aviation and Coastal Command be combined to form the Naval Air Command—or what you will. Under the R.A.F. the pilot would be trained for one purpose. To fly, from ship or shore. His future would be clear cut.

The advantages are many. There is, however, one big disadvantage. That of control—operational and training.

This problem was, no doubt, well thrashed out before the war. The decision then was that the Navy should control its own air force. It is conceivable that the lessons of the war have proved it a wrong one. Be that as it may, there is a compromise. The second alternative.

A Naval Air Force

I suggest a more definite demarcation between the Navy and Naval Aviation. To the extent that the aircrew and specialists of the latter should be little more than R.A.F. personnel in "dark blue." Unlike the "Naval Air Command," this air branch would for all training, operational, and administrative purposes be essentially a Naval prerogative. This is a big step, and a contro-

. . . a very rude awakening . . .

versial one, but the only means whereby Naval Air can acquire the desired training and experience.

From the very start the embryo officer-pilot should be trained for air warfare. Initial training should be at a Naval Air College similar to Cranwell. Future training should be carried out in the

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Both Fish and Fowl Fly

By Flight Lieutenant E. F. Davis, D.F.C.

NAVAL bods, or shall we say "webbed-footed" types, are quite human really, but are inclined to be—well—a little dogmatic. I had the pleasure to work with many during the war and learnt much from them, particularly on three occasions.

After a coastal O.T.U. in Canada a crowd of us signed a death warrant and were shipped off to Northern Ireland for a "Torps" course. No! not the normal "phish" gen because A.M. by that time had started to develop night torps and were using "Torpingtons"—Wimps converted, for the benefit of the uninitiated. There was much involved, not to mention perfect instrument flying on the run in, and before we had finished we were not only —— hot at split-arsed flying on the deck but had the odd clue on battle waggons, cruisers and little 'uns.

The strategy angles were complicated—flare dropping, "drips," using the moonpath, in Britain too, and employing the element of surprise successfully, but with large doses of best "Liffey water" and naval gin we managed to cope! The gin, of course, came from the Derry flotilla of frigates, *Exe, Tay,* etc., and after a few dinner parties aboard we soon found out a thing or two. Criticize if you will, but these purely social events contribute big things when a common feature is involved, for despite best wardroom and mess etiquette the hangar doors are, as you know, never completely closed.

Gen was swapped quite freely on low flying, avoiding action both by naval and air craft, low-level ack-ack and, above all, removing the ensign from the masthead. The Navy got awfully cheesed at being so continuously shot-up, and we really couldn't have grumbled if it had closed shop and refused to co-operate. As it was, however, we soon developed personal contacts with individual ships, and instead of long formal and boring V/S conversations we adopted a quick and personal R/T two-way banter. Yes, unofficial, perhaps, but speedy and effective—as I'll prove later.

Thus, though few official opportunities were provided for very close co-operation, the ale jug and gin bottle loosened tongues and broke down awkward barriers to the benefit of all. We each picked up from the other many quips and quirks of naval and air strategy. After all, these frigate boys were masters at dealing with waterborne "Phish"; why not develop their artistry in relation to airborne stuff as well? We, for our part, saw many Wimps in many attitudes through their Bofors, Oerlikon and pom-pom sights—and quite frightening truths were learned. Our Torp instructors were drawn from 38 and 121 of Malta fame and were all gen boys, but even so the immense success of the night torps was to a large extent attributable to this—well—collusion, if you like. Then the Middle East playground closed up—so we'd had it.

Eventually I found myself in Congella, Durban, as a "Joe" on a Boat Squadron. I've never forgiven A.M. or H.Q.M.E., whichever it was, for that posting—to be torn from Wimps, the ladies of the sky!

However, not to worry, I learned a lot and, above all, to appreciate the tough time second pilots had during the war. The two flight commanders were decent types and I was soon qualified day only; anyway, it's the experience that counts, and when I eventually got back home to my dear old Wimps I had another 1,000 hours or so under my belt.

Of boat days, two events stand out above the rest. After leaving Durban the squadron was sent north to Dar-es-Salaam and we had bags to do, but before long a couple of boats were detached via Aden to Masira Island, just a few miles south-south-west of the Gulf of Oman. The alighting area there had a five to six knot set, was tidal and narrow, and there were no buoys of much use for a while—but we coped. Refuelling was done from four-gallon cans which had to be carried over sand quite a distance before being loaded into a rowing dinghy for passage to the boats. We had no labour for the first few months, fresh water came from Karachi 600 miles away every six months, there was no green-stuff, and, above all, we did all the chores ourselves. Yes, easy enough really —if the detachment had had more than two boats to start with, each of which had to alternate on P.L.E. trips. We did about 200 hours in each of the first two months. We chased Jerry and Wop subs like will-o'-the-wisps, and did not even get an attack in—but ships were still sunk regularly. Greens, whites, mauves came by field telephone over twenty miles of sand, and often we were cut off from our Ops Room for two or three days on end because of a break in the line.

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The point? Good as Ops were, and H.Q. for that matter, what we wanted there was the naval touch. Maybe the Navy wouldn't have known or have been able to do more than we did—maybe not, but there is much in intelligent anticipation and that cannot be done efficiently in matters nautical unless one can think in naval terms, and surely, therefore, the best equipped person for such a job is the "web-footed" type himself.

The months passed and our rather unproductive detachment came to an end, and off towards base we went only to find that a day or two later we were off again on another one. This time it was to Mauritius on a special Op., and what a job it turned out to be! There was much preparation and some non-committal briefing which terminated in our receiving pukka sealed orders which were opened when we became waterborne. So it was—we got airborne, circumvented a cyclone in a Catalina at 11,500 feet, and rendezvoused with the *Relentless* 1,400 miles away, we carrying neither a bomb nor a bullet, just gas. We set course on a C.L.A. from the datum point and soon found the "needle"—a tanker refuelling two subs. We were briefed to ditch after fuel ran out, but fortunately a weather proviso was added, and in finding the target so early we were able to bring *Relentless* on and then crawl home at about 200 to 600 ft. because we hadn't enough fuel to get height. *Relentless* whipped eight torps into the Hun, picked up survivors and dashed for home.

Three days later the co-operation was consolidated by a grand prang aboard, at which our C.O.'s pants were hoisted at the yard-arm; but here again we had seen close, amicable, real combined ops. which would have gladdened the heart of even the most dogmatic Senior Service man. Even Jimmy-the-One, whose number had dried long enough ago, admitted that "Well, perhaps it was a trifle easier with you blokes around," and I certainly went home that night—or morning—even more convinced than before of the potentialities of this "We'll find 'em, you fix 'em" idea.

I returned to the U.K., got back to Wimps and finally fetched up in Norfolk with 524 operating in E-boat alley. It was here that, after being grounded in a most disgraceful fashion, I learned my biggest lesson.

Here's the proof of the R/T stuff I mentioned earlier in this screed. Trials were done with M.T.Bs. fitted with V.H.F. being vectored by a controlling aircraft, and eventually a point was reached where we could bring these blood and thunder boys within a couple of hundred yards of a target. I remember doing some V.H.F. range trials with the frigate *Rioux*, and was answered by a steady Yorkshire voice. Months later, when Jerry fixed us one night, I broadcast a "Mayday" and exchanged greeting with *Rioux* as a parting shot. There was mutual recognition of voices—so you see it comes in handy occasionally. The vectoring was done on V.H.F. by our Radar op., who had a north-seeking P.P.I. on his Mark III radar, and eventually these operators really did convince the naval jobs that the "Bakers and Dogs" were the gen.

During the early trials one of our flight commanders was at M.T.B.H.Q. talking good honest R.A.F. lingo and dealing out super sales talk on this vectoring business. After my prang I succeeded him and realized what superb spadework he had put in, and on my arrival there my greatest allies were a "four-ringed captain" and his "Sparks." They were grand.

The C.Os. of the boats were still rather dubious about the whole set-up and continually extracted assurances from me about the boys dropping stuff on to them. Identification of forces was our main worry still, of course. However, we organized a steady stream of the naval jobs up to the Mess and fed them on R.A.F. beer and the "gen," and gradually of course they became enthusiastic flying types—and they always brought their own gin. Bless 'em. Reciprocal trips were laid on for our boys and liaison officers at both ends became part of the Ops. Room furniture. Eventually one could even speak normally in the Ward Room and be understood without having to offer these naval jobs a R.A.F. dictionary! All call-signs became mutually understood and types automatically knew who Yamak 38 or 22 was—in fact, some personal combinations soon grew up, and formidable they were too. In these closing months Jerry's E-boats had a warm time—and how those naval boys could fight! I often think what the results could have been had it all been started earlier. The vectoring was utilized offensively and defensively, and on one particular occasion the desirability of perfect briefing, understanding and trust in the other fellow was very strongly exemplified by the miscarriage of a strike. One of the boys found a convoy creeping towards Texel from Borkum and started passing B's and D's to a M.T.B. flotilla which went in for an attack. The aircraft's radar went for a burton at the crucial moment, however, and after the M.T.Bs. had missed the target he told them to sweep west. The flotilla leader actually swept east and did *not* regain contact. At the postmortem the next morning the leader opined that he thought it better to sweep east and disregard the aircraft's directions. Well! there you have it crystallized. Some folks are hard to convince.

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Marshal of the Royal Air Force Viscount Dowding's Despatch on THE BATTLE OF BRITAIN

THE following Despatch was submitted to the Secretary of State for Air on 20th August, 1941, by Air Chief Marshal Sir Hugh C. T. Dowding, G.C.B., G.C.V.O., C.M.G., A.D.C., Air Officer Commanding-in-Chief, Fighter Command, Royal Air Force.

PREAMBLE

I have been instructed by the Air Council to write a Despatch on the Air Fighting of last autumn, which has become known as the "Battle of Britain." The conditions are a little unusual because, firstly, the battle ended many months ago; secondly, a popular account of the fighting has already been written and published, and, thirdly, recommendations for Mention in Despatches have already been submitted.

I have endeavoured, therefore, to write a report which will, I hope, be of historical interest, and which will, in any case, contain the results of more than fours years' experience of the Fighter Command in peace and war.

20*th August*, 1941.

PART I.—PRELIMINARY

In giving an account of the Battle of Britain it is perhaps advisable to begin by a definition of my conception of the meaning of the phrase. The battle may be said to have started when the Germans had disposed of the French resistance in the summer of 1940, and turned their attention to this country.

The essence of their strategy was so to weaken our Fighter Defences that their Air Arm should be able to give adequate support to an attempted invasion of the British Isles. Experiences in Holland and Belgium had shown what they could do with armoured forces operating in conjunction with an Air Arm which had substantially achieved the command of the air.

This air supremacy was doubly necessary to them in attacking England because the bulk of their troops and war material must necessarily be conveyed by sea, and, in order to achieve success, they must be capable of giving air protection to the passage and the landing of troops and material.

The destruction or paralysis of the Fighter Command was therefore an essential prerequisite to the invasion of these islands.

Their immediate objectives might be convoys, radio-location stations, fighter aerodromes, seaports, aircraft factories, or London itself. Always the underlying object was to bring the Fighter Command continuously to battle, and to weaken its material resources and Intelligence facilities.

Long after the policy of "crashing through" with heavy bomber formations had been abandoned owing to the shattering losses incurred, the battle went on. Large fighter formations were sent over, a proportion of the fighters being adapted to carry bombs, in order that the attacks might not be ignorable.

This last phase was perhaps the most difficult to deal with tactically. It will be discussed in greater detail later on.

Night attacks by heavy bombers were continuous throughout the operations, and, although they persisted and increased in intensity as day bombing became more and more expensive, they had an essentially different purpose, and the "Battle of Britain" may be said to have ended when the Fighter and Fighter-Bomber raids died down.

It is difficult to fix the exact date on which the "Battle of Britain" can be said to have begun. Operations of various kinds merged into one another almost insensibly, and there are grounds for choosing the date of 8th August, on which was made the first attack in force against land objectives in this country, as the beginning of the battle.

On the other hand, the heavy attacks made against our Channel convoys probably constituted, in fact, the beginning of the German offensive; because the weight and scale of the attack indicates that the primary object was rather to bring our fighters to battle than to destroy the hulls and cargoes of the small ships engaged in the coastal trade. While we were fighting in Belgium and France we suffered the disadvantage that even the temporary stoppage of an engine involved the loss of pilot and aircraft, whereas, in similar circumstances, the German pilot might be fighting again the same day, and his aircraft be airborne again in a matter of hours.

In fighting over England these considerations were reversed, and the moral and material disadvantages of fighting over enemy country may well have determined the Germans to open the attack with a phase of fighting in which the advantages were more evenly balanced. I have therefore, somewhat arbitrarily, chosen the

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events of 10th July as the opening of the battle. Although many attacks had previously been made on convoys, and even on land objectives such as Portland, 10th July saw the employment by the Germans of the first really big formation (seventy aircraft) intended primarily to bring our Fighter Defence to battle on a large scale.

I had fifty-nine squadrons in various stages of efficiency. A list of these units, with supplementary information, is given in Appendix A. Many of them were still suffering from the effects of the fighting in Holland and Flanders, at Dunkirk, and during the subsequent operations in France. Others were in process of formation and training. But, if the lessons of the battle are to be correctly appreciated, due consideration must be given to the factors leading up to the situation existing when it began. Leaving out of account peace-time preparations and training, the Battle of Britain began for me in the Autumn of 1939.

The first major problem arose during the discussion of the question of sending fighter squadrons to France. The decisive factor was that of supply. Our output at the beginning of the war was about two Hurricanes and two Spitfires per diem; and, although there were hopes of increasing Hurricane production, there was then no hope that Spitfire production would be materially increased for about a year. It is true that certain optimistic estimates had been made, but there were reasons to believe that these could not be implemented. At that time, we in England were out of range of German fighters, and I had good hopes that unescorted bomb raids on this country could be met and defeated with a very small loss in fighters; but there could be no illusions concerning the wastage which would occur if we came up against the German fighters in France.

I therefore regarded with some apprehension the general policy of sending Home Defence Fighter Units to France; but, as it was clear that such an attitude was politically untenable, I wrote on 16th September, 1939, a letter to the Air Ministry. In this letter I pointed out that the Air Staff Estimate of the number of fighter squadrons necessary for the defence of this country was fifty-two, and that on the outbreak of war I had the equivalent of thirty-four (allowing for the fact that some Auxiliary squadrons were only partially trained and equipped).

I wanted twelve new squadrons, but asked that eight should be raised immediately, and made proposals for their location and employment. In a letter dated 21st September the Air Ministry regretted that the most they could do towards meeting my requirements was to form two new squadrons and two operational training units. I was invited to a meeting of the Air Council on 26th September.

On 25th September I wrote expressing my disappointment and asking for a reconsideration. As a result of this letter, the Air Council Meeting, and a further meeting under the chairmanship of the Deputy Chief of Air Staff, the Air Ministry wrote on 9th October sanctioning the immediate formation of eight new squadrons, though six of these could be formed initially only as half-squadrons owing to shortage of resources. This correspondence is too lengthy to reproduce here, but it deals also with my apprehensions concerning Hurricane wastage in France, which were realized in the spring of 1940. It also dealt with an estimate worked out by the Air Ministry Organization Staff that after three months of fighting we might expect the fighter strength to have been reduced to twenty-six squadrons.

In October, 1939, the Air Ministry further reconsidered their policy, and ordered the formation of ten additional Fighter Squadrons, four of which were destined for the Coastal Command.

In January, 1940, the northern flank of our continuous defence organization was on the Forth, and the south-western flank was at Tangmere in Sussex (with the exception of an isolated station at Filton for the local defence of Bristol and the mouth of the Severn). On 2nd and 4th February I wrote two letters pointing out these limitations, and asking for an extension of aerodrome facilities, Intelligence cover and communications.

On 9th February I was told that a paper was in preparation, and that I would be given an opportunity to remark on the proposals at a later stage.

On 16th March I received the paper referred to and forwarded my comments on 23rd March.

On 8th May I received a letter saying that a reply had been delayed. The proposals were now approved, and decisions would shortly be taken.

This delay was presumably unavoidable, but the result was that the organization and development of the defences of the south and west of England were very incomplete when they were called upon to withstand the attacks which the German occupation of French aerodromes made possible.

The fighting in Norway has only an indirect bearing on this paper. Certain useful tactical lessons were gained, particularly with regard to deflection shooting, and I trust that the story of the epic fight of No. 263 Squadron under Squadron-Leader J. W. Donaldson, D.S.O., near Andalsnes, may not be lost to history.

The outcome, as it affects this account, was the virtual loss of two squadrons in the sinking

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of the Aircraft Carrier *Glorious* after the evacuation of Narvik.

Next came the invasion of Holland, and the call to send fighters to the assistance of the Dutch. The distance to Rotterdam was about the extreme range of the single-seater fighter, which therefore operated under the disadvantage of having a very brief potential combat-time, followed by the necessity of a long sea-crossing on the homeward way. The Blenheims, of course, had the necessary endurance, but they had not been designed as fighters, and their use against day fighters proved costly in comparison with the limited success which they attained.

The Defiants were used here for the first time, and, although they proved very effective against unescorted bombers, they, too, suffered heavy casualties when they encountered fighters in strength. As the result of this experience I formed the opinion that the Blenheims should be kept exclusively for night fighting, if possible, while I retained an open mind about the Defiants pending some experience of short-range fighting.

Then began the fighting in Belgium and Northern France, and at once my fears about the incidence of wastage in this type of fighting began to be realized.

At the beginning of April, 1940, there were six fighter squadrons in France.

Then four more complete squadrons were sent when the fighting began.

Then on 13th May thirty-two pilots and aircraft were sent, say the equivalent of two squadrons.

Almost immediately afterwards eight half-squadrons were sent. This was done under the impression that the loss of eight half-squadrons would affect me less than that of four entire squadrons, because it was supposed that I should be able to rebuild on the nuclei left behind. But this assumption was incorrect because I had neither the time nor the personnel available for purposes of reconstruction, and the remaining half-squadrons had to be amalgamated into composite units with a resulting disorganization and loss of efficiency. At this time, too, I was ordered to withdraw trained pilots from squadrons and to send them overseas as reinforcements.

I had now lost the equivalent of sixteen squadrons, and in addition four squadrons were sent to fight in France during the day and to return to English bases in the evening.

Other pilots were withdrawn from the Command through the system by which the Air Ministry dealt direct with groups on questions of personnel.

It must be remembered that during this period the Home Defence squadrons were not idle, but that Hurricane squadrons were participating in the fighting to a considerable extent, four squadrons daily left south-east England with orders to carry out an offensive patrol, to land and refuel in France or Belgium, and to carry out a second sortie before returning to England.

Hitherto I had succeeded generally in keeping the Spitfire squadrons out of the Continental fighting. The reason for this, as stated above, was that the supply situation was so bad that they could not have maintained their existence in face of the aircraft casualty rate experienced in France: between 8th May and 18th May 250 Hurricanes were lost.

When the Dunkirk fighting began, however, I could no longer maintain this policy, and the Spitfires had to take their share in the fighting.

When the Dunkirk evacuation was complete I had only three day-fighting squadrons which had not been engaged in Continental fighting, and twelve squadrons were in the line for the second time after having been withdrawn to rest and re-form.

All this time, it must be remembered, the attack on this country had not begun; with a few accidental exceptions no bomb had been dropped on our soil. I was responsible for the Air Defence of Great Britain, and I saw my resources slipping away like sand in an hour-glass. The pressure for more and more assistance to France was relentless and inexorable. In the latter part of May, 1940, I sought and obtained permission to appear in person before the War Cabinet and to state my case. I was accorded a courteous and sympathetic hearing, and to my inexpressible relief my arguments prevailed and it was decided to send no more fighter reinforcements to France except to cover the final evacuation.

I know what it must have cost the Cabinet to reach this decision, but I am profoundly convinced that this was one of the great turning points of the war.

Another decision, of perhaps equal importance, was taken at this time. I refer to the appointment of Lord Beaverbrook to the post of Minister of Aircraft Production. The effect of this appointment can only be described as magical, and thereafter the supply situation improved to such a degree that the heavy aircraft wastage which was later incurred during the "Battle of Britain" ceased to be the primary danger, its place being taken by the difficulty of producing trained fighter pilots in adequate numbers.

After the evacuation from Dunkirk the pressure on the Fighter Command became less intense, but it by no means disappeared. Hard fighting took place along the coast from Calais to Le Havre to cover the successive evacuations from that coast. Then the centre of gravity

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shifted to Cherbourg and its neighbourhood, and the "Battle of Britain" followed on without any appreciable opportunity to rest and re-form the units which had borne the brunt of the fighting.

The above considerations should be kept in mind when Appendix A (Order of Battle on 8th July, 1940) is being studied.

The fall of Belgium and France had increased the danger to the south and west of England, and had necessitated a considerable modification of the original arrangements when bombing attacks could start only from German soil.

The distribution of Army units was, as a matter of fact, in a condition of perpetual change to meet new situations as they arose, and I must pay a very sincere tribute to the flexibility of the Army organization, and to the tact, patience and loyalty of the Commander-in-Chief of the Anti-Aircraft Command, Lieut.-General Sir Frederick A. Pile, Bart., K.C.B., D.S.O., M.C., which enabled these constant changes to be made without disorganization.

In theory the Commander-in-Chief, Fighter Command, was the authority responsible for settling the dispositions of all guns allotted to the Air Defence of Great Britain; but this was little more than a convenient fiction. The number of guns available was so inadequate for the defence of all the vulnerable targets in the country, and the interests concerned were so diverse and powerful that it was not to be supposed that an individual member of any one Service would be left to exercise such a prerogative uninterruptedly. A disproportionate amount of my time was taken up in discussions on gun distribution, and each decision was at once greeted with a fresh agitation, until finally I had to ask that all proposals should be discussed by a small committee on which all interests were represented, and I normally accepted the recommendations of this committee during quiet periods. During active operations I consulted General Pile, and we acted according to our judgment.

One rather important lesson emerged from our experience, viz., that the general fire-control of all guns in the air defence system should be vested in the air defence authorities. I do not, of course, mean that, if an invasion had taken place, the guns co-operating with the troops in the field should have been subordinated to any A.A. Defence Commander, but the existence of "free-lance" guns,* the positions and even the existence of which were unknown to me, was an appreciable handicap, especially at night. It was impossible to acquaint them with the approach of enemy raiders, or of the fact that our own aircraft were working in the vicinity.

When the night attacks on London began to be really serious, General Pile, in consultation with myself, decided to send heavy reinforcements. Within twenty-four hours the defences to the south and south-east of London were approximately doubled, and the great increase in the volume of fire was immediately noticed and had a very good effect on public morale. The physical effect in the shape of raiders destroyed was by no means negligible, but the main effect was never generally known. The track of every raid was, of course, shown on various operations tables, and on some nights as many as 60 per cent. of the raiders approaching London from the south turned back after dropping their bombs in the open country or on the fringe of the barrage.

The A.A. guns at Dover enjoyed unusual opportunities for practice, with the result that their crews became acknowledged experts in the art of anti-aircraft gunnery. Their skill, however, was attained through the circumstance that they and the Dover Balloon Barrage were continuously the objectives of German attack; they manned their guns continuously night and day, and I must pay a high tribute to their morale, enthusiasm and efficiency.

The balloon barrages had, at this stage, had little opportunity of justifying their existence, except perhaps at Rosyth and Scapa Flow, since bombing attacks against land objectives in Britain had not yet begun. It was thought, however (and later experience confirmed this opinion), that the heavy cost of their installation and maintenance, and their drain on man-power, were on the whole justified. It is true that their material results, in terms of enemy aircraft destroyed, were not impressive; they suffered staggering casualties in electric storms, and had brought down a number of our own aircraft; on the other hand, they exercise a very salutary moral effect upon the Germans and to a great extent protected the vital objectives, which they surrounded, against low-altitude attacks and dive-bombing.

This is not the place to give an account of the romantic discovery and development of radio location. It may be explained, however, that the backbone of the system consisted of a series of large "chain" stations at intervals averaging about thirty miles. These gave warning, by means of reflected electrical echoes, of the presence of aircraft within the radius of their effective action, which attained to nearly 200 miles in the most favourable circumstances. The average effective

* These guns belonged to Field Force Units. As such units were, of necessity, highly mobile, their exact location was not always known to Fighter Command. Nor, after a recent move, were they always included in the telephone system.

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radius was about eighty miles, but they had the serious limitation that they failed altogether to give indications of aircraft flying below 1,000 feet.

To overcome this disability, which was particularly hampering to operations against low-flying minelayers, smaller units called "C.H.L. Stations" were included in the protective line.

These had a restricted range (about thirty miles), and were incapable of giving heights with any degree of accuracy; they were, however, extremely accurate in azimuth, and constituted an essential feature of the defensive and warning systems.

The radio location system was growing so fast and had to meet so many calls from overseas that the training of the technical personnel and the maintenance of the elaborate scientific apparatus presented great difficulties. In spite of these handicaps, however, the system operated effectively, and it is not too much to say that the warnings which it gave could have been obtained by no other means and constituted a vital factor in the Air Defence of Great Britain.

The functions of the Observer Corps (since granted the "Royal" prefix) are too well known to require description here. Suffice it to say that this loyal and public-spirited body of men had maintained their watch with admirable efficiency since the beginning of the war and throughout a winter of exceptional severity. It is important to note that, at this time, they constituted the sole means of tracking enemy raids once they had crossed the coastline. Later experience was to show that "sound plots," which were all that could be given for night raiders, and aircraft flying above clouds or at extreme altitudes, were not adequate for purposes of accurate interception; but their work throughout was quite invaluable. Without it the air raid warning systems could not have been operated, and inland interceptions would rarely have been made.

The credit for building up and developing the Observer Corps in recent years is due largely to its Commandant, Air Commodore A. D. Warrington Morris, C.M.G., O.B.E.

The Air raid warning system was operated centrally from Fighter Command headquarters (with a small exception in the Orkneys and Shetlands).

The country was divided into about 130 "Warning Districts," the boundaries of which were determined by the lay-out of the public telephone system. These districts were shown on a map in my operations room, and the tracks of all enemy raids, whether over the land or sea, were plotted by means of counters deposited and removed as necessary by a number of "Plotters."

The counters were of three colours, according to the five-minute period in which they were placed on the table. This was necessary to facilitate their removal at the end of fifteen minutes, and so to obviate the confusion caused by "stale plots."

Three telephone operators were in continuous communication with the Trunk Exchanges in London, Liverpool and Glasgow, and when a raid was within twenty minutes' flying distance of a warning district the air raid warning officer would send a message, as, for instance: "10. Norwich. Yellow." The London operator would transmit this to the London Trunk Exchange, and the London operator would immediately retransmit it to Norwich, where other operators would pass it on to approved recipients in the warning district. This was a preliminary caution for the information of Police, Fire Stations, etc., and involved no public warning.

About five minutes later, if the said district were still threatened, a "Red Warning" would be given. This was the signal for the sirens to sound. A "Green" signal indicated "raiders passed," and the sirens sounded the "all clear."

At night, when it became essential to maintain exposed lights in dockyards, railway sidings and factories up to the last minute, so as to obviate unnecessary loss of working time, a "Purple" warning was introduced. This was a signal for the extinction of exposed lights, but it did not connote a public warning.

There were also subsidiary warnings, transmitted by a fourth operator, to close down radio stations which might assist the enemy's navigation by enabling him to use wireless direction finding.

The credit for working out this system in conjunction with the Home Office is due largely to Air Vice-Marshal A. D. Cunningham, C.B.E.

The Fighter Command was divided into groups and sectors in accordance with the arrangement shown in Appendix AA. Only Nos. 11, 12 and 13 Groups were fully organized at the beginning of the battle. Each group and sector headquarters had an Operations Table generally similar to that already described at Command Headquarters, but covering an appropriately smaller area. The British Isles and neighbouring seas were covered by an imaginary "grid" which was used by all concerned for plotting purposes. An expression consisting of one letter and four digits gave the position of a point with an accuracy of one square kilometre.

Plots from which tracks could be built up were received first from the radio location station, and later from the Observer Corps (and to a small extent from the searchlight detachments) after a raid had crossed the coast.

All radio location plots came to a "Filter

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Room" table at Command Headquarters (next door to the room in which the Operations Table was situated), and, after surplus information had been eliminated, tracks were passed by direct telephone line simultaneously to my Operations Table and to those of groups and sectors concerned.

Observer Corps plots, on the other hand, went first to Observer Group centres (where plotting tables were also installed) and thence to Sector and Fighter Group Operations tables. The tracks were then "told" to my Operations Room from the Group Tables.

In order to avoid waste of flying effort and false air raid warnings it was obviously very necessary to differentiate between friendly and enemy formations, and this was the most difficult as well as the most important task of my Filter Room. Liaison officers from Bomber and Coastal Commands were permanently on duty, and they were in possession of all available information concerning the operations of our own bombers and coastal patrols. During 1940 an electrical device became generally available which modified the echo received by the radio location system from our own aircraft in a characteristic manner. This was of the greatest value.

The credit for working out the complicated details of the Filter Room belongs largely to Wing Commander (now Group Captain) R. G. Hart, C.B.E.

It appeared to me quite impossible to centralize tactical control at Command Headquarters, and even Group Commanders would be too busy during heavy fighting to concern themselves with details of interception.

The system was that the Command should be responsible for the identification of approaching formations and for the allotment of enemy raids to groups where any doubt existed. Group Commanders decided which sector should meet any specified raid and the strength of the fighter force which should be employed. Sector Commanders detailed the fighter units to be employed and operated the machinery of interception.

Various states of preparedness were laid down, *e.g.*, Released, Available (20 minutes), Readiness (5 minutes), and Stand-by (2 minutes), and sectors reported all changes to Group Headquarters, where an up-to-date picture of the state of affairs was recorded by lights on the walls of the Operations Room. Various laison officers from the Observer Corps, guns and searchlights were maintained in Group and Sector Operations Rooms.

It will be seen that the Sector Commander had on his table the best available information as to the position and track of an enemy formation; but, in order to effect an accurate interception, it was necessary that he should also know the position and track of his own fighters.

This was recorded by means of R/T D/F (Radio Telephony Direction Finding). R/T signals were transmitted automatically for fifteen seconds out of each minute by selected fighter aircraft and were picked up by two or three D/F stations installed in sectors for the purpose. The readings were passed by direct telephone lines to Sector Headquarters, and a mechanical plotting device gave an almost instantaneous plot of the fighter's position.

In the more recently organized sectors these D/F stations had not been installed, and it was necessary to keep track of the fighters by giving them precise orders as to speed and direction, and plotting their tracks by dead reckoning. This method was adequate only if the force and direction of the wind at various altitudes could be correctly estimated.

The Sector Commander could thus see on his operations tables the positions and courses of enemy formations and of his own fighters, and was enabled so to direct the latter as to make interceptions with the former in a good percentage of occasions by day. Interception depended, of course, on the fighters being able to see the enemy, and, although the system worked adequately against enemy formations in daylight, the degree of accuracy obtainable was insufficient to effect interception against night raiders not illuminated by searchlights, or against individual aircraft using cloud cover by day.

Orders were given to pilots in their aircraft by means of a very simple code which could be easily memorized. For instance, "Scramble" meant "Take Off," "Orbit" meant "Circle," "Vector 230" meant "Fly on a course of 230 degrees."

I realized that the enemy might pick up the signals and interpret them, but any elaborate code was out of the question if it included reference to some written list in the air.

As a matter of fact the enemy did pick up and interpret the signals in some cases, but not much harm was done, except when they were able to discover the height at which a formation was ordered to operate, and the time when it was ordered to leave its patrol line and land.

"Pancake" was the signal for the latter operation, and I therefore introduced several synonyms, the significance of which was not obvious to the enemy.

The code word for height was "Angels," followed by the number of thousands of feet; when it appeared probable that the enemy were taking advantage of this information I introduced a false quantity into the code signal. Thus "Angels 18" really meant "Fly at 21,000 and not 18,000." On

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more than one occasion German fighter formations arriving to dive on one of our patrols were themselves attacked from above.

The system as a whole had been built up by successive steps over a period of about four years, and I was not dissatisfied with the way in which it stood the test of war.

The steps taken to devise a system of night interception are described later in this Despatch.

I must now give a brief account of the characteristics of the aircraft commonly employed on both sides. As regards the fighter types available in the Command, the bulk of the force consisted of Hurricanes and Spitfires; the former were beginning to be outmoded by their German counterparts. They were comparatively slow and their performance and manœuvrability were somewhat inadequate at altitudes above 20,000 ft. The Spitfires were equal or superior to anything which the Germans possessed at the beginning of the battle.

The Hurricanes and Spitfires had bulletproof windscreens and front armour between the top of the engine and the windscreen. They also had rear armour directly behind the pilot, which was previously prepared and fitted as soon as we began to meet the German fighters. The early adoption of armour gave us an initial advantage over the Germans, but they were quick to imitate our methods. While German aircraft remained unarmoured, I think it is now generally agreed that the single-seater multi-gun fighter with fixed guns was the most efficient type which could have been produced for day fighting. With the advent of armour some change in armament and/or tactics became necessary, and the subject is discussed in more detail in Appendix F.*

The Defiant, after some striking initial successes, proved to be too expensive in use against fighters and was relegated to night work and to the attack of unescorted bombers.

The Blenheim was also unsuitable for daytime combat with fighters, owing to its low speed and lack of manœuvrability. It had been relegated to night duties for these reasons, and because adequate space was available in its fuselage for an extra operator and the scientific apparatus which was necessary for the development of a new night-interception technique. The cockpit had not been designed for night flying and the night view was extremely bad. Its already low performance had been further reduced by certain external fittings which were essential for the operation of the radio detecting apparatus.

The Beaufighter was looked on as a Blenheim replacement in which most of the above disadvantages would be overcome. Its speed promised to be adequate and its armament consisted of four 20-mm. cannons instead of the five .303-inch Brownings of the Blenheim. There was thus hope that decisive fire could be brought to bear in the short period during which visual contact could be expected to be maintained at night.

Like the Blenheim, it had not been designed as a night fighter (it was an adaptation of the Beaufort Torpedo Bomber), and the night view from the cockpit was bad; but Air Vice-Marshal Sir Q. Brand, K.B.E., D.S.O., M.C., D.F.C., a veteran night fighter of the previous war, had designed a new cockpit lay-out, which did not, unfortunately, materialize during my tenure of the Fighter Command. The output of Beaufighters was also very low.

Another type which was pressed into service as a night fighter was the Douglas D.B.7 (now the Havoc). It had low fire power and comparatively poor performance with its original engines. Its chief advantage lay in its tricycle undercarriage, which proved very popular for landings in bad visibility. Only one squadron of these was in being when I left the Command.

One squadron of Gladiators was still in use in the Command. As explained above, the organization of No. 10 Group was not complete, and there was no large aerodrome close enough to Plymouth to allow of direct protection being given to that town and to the dockyard at Devonport. A squadron of Gladiators was therefore located at a small aerodrome called Roborough in the immediate vicinity. The Gladiators, though slow by modern standards, were very manœuvrable, and had given good results in Norway by deflection shooting in the defence of fixed objectives, where the bombers could not avoid the Gladiators if they were to reach their targets.

Some American single-seater aircraft were in Great Britain, but the types then available were deficient in performance and fire power and were not employed to any material extent.

The Whirlwind raised high hopes in some quarters. It claimed a very high top speed and carried four cannon guns. It had, however, a totally inadequate service ceiling (about 25,000 ft.) and a poor performance at that altitude. It also suffered from a continuous series of teething troubles, and the single squadron equipped with this type was never fit for operations in my time.

It is very difficult to give any kind of concise description of the types of enemy aircraft used during the battle. The Germans while adhering to broad standard types, were continually modifying and improving them by fitting more powerful engines and altering the armament. The original Messerschmitt 109, for instance, had a performance comparable with that of the Hurricane, but the latest type could compete with the

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Spitfire, and had a better ceiling. Some of them had four machine guns and others had two. Some were fitted to carry bombs and some were not.

The Messerschmitt 110 was a twin-engined fighter designed primarily for escorting bombers and used also as a fighter-bomber. It was somewhat faster than the Hurricane, but naturally much less manœuvrable than the single-engined types. Its usual armament was two fixed cannons and four machine guns firing forward, and one free machine gun firing to the rear. Our pilots regarded it as a less formidable opponent than the later types of Me.109.

The Heinkel 113 Fighter made its appearance in limited numbers during the battle. It was a single-seater, generally resembling the Me.109. Its main attributes were high performance and ceiling, so that it was generally used in the highest of the several layers in which attacking formations were usually built up.

The Junkers 87 was a single-engined dive-bomber. It had a low performance (top speed well under 250 m.p.h.). It had two fixed machine guns firing forward and one free gun firing to the rear. When it was able to operate undisturbed by fighters it was the Germans' most efficient bomber against land or sea targets owing to the great accuracy with which it dropped its bombs; but when it was caught by fighters it was nothing short of a death-trap, and formations of Ju. 87's were practically annihilated on several occasions.

The Heinkel 111 and the various types of Dornier (17, 17Z and 215) constituted the main element of the German striking force. They were twin-engined aircraft and were generally similar, although the former was slightly the larger. Their speed was something over 250 m.p.h., and their armament consisted normally (but not always) of four free machine guns firing backward and one firing forward. Their radius of action varied with tankage and bomb load, but, if necessary, all objectives in England and Northern Ireland could be reached from aerodromes in France.

The Junkers 88 was the most modern of the German bombers. It also was a twin-engined type with a performance of about 290 m.p.h. Its armament was generally similar to that of the He.111 and the Dorniers and it had a slightly longer range. It could be used on occasions as a dive-bomber and, though probably somewhat less accurate than the Ju.87 was much less vulnerable owing to its superior performance and armament.

Before beginning an account of the battle, I must refer briefly to the publication entitled *The Battle of Britain*, issued by the Air Ministry. This, if I may say so, is an admirable account of the battle for public consumption, and I am indebted to it, as well as to the book *Fighter Command*, by Wing Commander A. B. Austin, for help in the compilation of this despatch. There is very little which I should have wished to alter, even if circumstances had permitted my seeing it before publication (I was absent in America at the time), but there are two points to which I should like to draw attention:

In the diagram on page 7 the speed of the Hurricane is seriously over-rated at 335 m.p.h. I carried out a series of trials to obtain the absolute and comparative speeds of Hurricanes and Spitfires at optimum heights. Naturally the speeds of individual aircraft varied slightly, but the average speed of six Hurricanes came out at about 305 m.p.h.

The second point is of greater importance. I quote from page 33: "What the Luftwaffe failed to do was to destroy the Fighter Squadrons of the Royal Air Force, *which were, indeed, stronger at the end of the battle than at the beginning.*" (The italics are mine.)

This statement, even if intended only for popular consumption, tends to lead to an attitude of complacency which may be very dangerous in the future. Whatever the study of paper returns may have shown, the fact is that the situation was critical in the extreme. Pilots had to be withdrawn from Bomber and Coastal Commands and from the Fleet Air Arm and flung into the battle after hasty preparation. The majority of the squadrons had been reduced to the status of training units, and were fit only for operations against unescorted bombers. The remainder were battling daily against heavy odds.

The indomitable courage of the fighter pilots and the skill of their leaders brought us through the crises, and the morale of the Germans eventually cracked because of the stupendous losses which they sustained.

Any attempt to describe the events of the battle day by day would make this despatch unduly long and would prevent the reader from obtaining a comprehensive picture of the events. I have therefore decided to show the main features of each day's fighting in an Appendix on which our own and the Germans' aircraft casualties will be shown graphically. I shall then be able to deal with the progress of the battle by phases, thus avoiding the tedious and confusing method of day-to-day description. The information is given in Appendix "D."

As regards our casualties, we generally issued statements to the effect that we lost "x" aircraft from which "y" pilots were saved. This did not, of course, mean that "y" pilots were

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ready immediately to continue the battle. Many of them were suffering from wounds, burns or other injuries which precluded their return to active flying temporarily or permanently.

It might also be assumed that all German crews who were in aircraft brought down during the battle were permanently lost to the Luftwaffe because the fighting took place on our side of the Channel. Such an assumption would not be literally true, because the Germans succeeded in rescuing a proportion of their crews from the sea by means of rescue boats, floats and aircraft which will be later described.

The decisive features of the battle were the ratio of casualties incurred by ourselves and the Germans, and the ratio of casualties to the numbers actively employed on both sides. Appendix "D" has been drawn up with these points in mind.

I must disclaim any exact accuracy in the estimates of enemy losses. All that I can say is that the utmost care was taken to arrive at the closest possible approximation. Special intelligence officers examined pilots individually after their combats, and the figures claimed are only those recorded as "Certain." If we allow for a percentage of over-statement, and the fact that two or more fighters were sometimes firing at the same enemy aircraft without being aware of the fact, this can fairly be balanced by the certainty that a proportion of aircraft reported as "Probably Destroyed" or "Damaged" failed to return to their bases. The figures, then, are put forward as an honest approximation. Judging by results, they are perhaps not far out.

The German claims were, of course, ludicrous; they may have been deceived about our casualties, but they know they were lying about their own.

I remember being cross-examined in August by the Secretary of State for Air about the discrepancy. He was anxious about the effect on the American people of the wide divergence between the claims of the two sides. I replied that the Americans would soon find out the truth; if the Germans' figures were accurate they would be in London in a week, otherwise they would not.

Our estimate of German casualties, then, may be taken as reasonably accurate for practical purposes; but our estimates of the strength in which attacks were made is based on much less reliable evidence. The radio-location system could give only a very approximate estimate of numbers and was sometimes in error by three or four hundred per cent. This is no reflection on the system, which was not designed or intended to be accurate in the estimation of considerable numbers; moreover, several stations were suffering from the effects of severe bombing attacks. As the average height of operations increased, the Observer Corps became less and less able to make accurate estimates of numbers, and, in fact, formations were often quite invisible from the ground.

Even the numerical estimates made by pilots who encountered large formations in the air are likely to be guesswork in many instances. Opportunities for deliberate counting of enemy aircraft were the exception rather than the rule.

Although secret intelligence sources supplemented the information available, it is possible that on days of heavy fighting complete formations may have escaped observation altogether.

This is unfortunate, because it is obviously of the greatest importance to determine the relative strengths of the attack and the defence, and to know the ratio of losses to aircraft employed which may be expected to bring an attack to a standstill in a given time. History will doubtless elucidate the uncertainty, but perhaps not in time for the information to be of use in the present war.

My personal opinion is that, on days of slight activity, our estimates are reasonably accurate, but that they probably err on the low side on days of heavy fighting when many and large formations were employed.

As has been explained above, few squadrons were fresh and intact when the battle began. No sufficient respite has been granted since the conclusion of the Dunkirk fighting to rest the squadrons which had not left Fighter Command, and to rebuild those which had undergone the ordeal of fighting from aerodromes in Northern France. These last had been driven from aerodrome to aerodrome, able only to aim at self-preservation from almost continuous attack by bombers and fighters; they were desperately weary and had lost the greater part of their equipment, since aircraft which were unserviceable only from slight defects had to be abandoned.

PART II.—THE BATTLE

The battle may be said to have divided itself broadly into four phases: first, the attack on convoys and coastal objectives, such as ports, coastal aerodromes and radio-location stations. Second, the attack on inland fighter aerodromes. Third, the attack on London. And, fourth, the fighter-bomber stage, where the target was of importance quite subsidiary to the main object of drawing our fighters into the air and engaging them in circumstances as disadvantageous to us as possible. These phases indicated only general tendencies; they overlapped and were not mutually exclusive.

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"The Oaks"—Fayid Lido

Fayid Lido—Donkey "Derby"

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Preparing for a Race

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It has been estimated that the Germans sent over, on an average throughout the battle, four fighters to each bomber or fighter-bomber, but any such estimate must be very rough.

I must emphasize, throughout, the extreme versatility of the German methods both in the timing and direction of their attacks, and in the tactical formations and methods employed.

They enjoyed the great advantage of having a wide front from which attacks could be delivered. First a blow would be delivered from Calais, perhaps against London; then after a carefully timed interval, when 11 Group fighters might be expected to be at the end of their petrol endurance, a heavy attack would be made on Southampton and Portland. Other attacks, after being built up to formidable dimensions, would prove to be only feints, and the bombers would turn away before reaching the coast of England, only to return again in half an hour, when the fighters sent up to intercept them were landing.

Time-honoured methods of escort were at first employed. A strong fighter formation would fly a mile or so behind and above the bombers. When the Germans found that our fighters could deliver a well-timed attack on the bombers before the fighters could intervene, or when our fighters attacked from ahead or below, each move was met by a counter-move on the part of the Germans, so that, in September, fighter escorts were flying inside the bomber formation, others were below, and a series of fighters stretched upwards to 30,000 feet or more.

One squadron leader described his impressions of the appearance of one of these raids; he said it was like looking up the escalator at Piccadilly Circus.

I must pay a very sincere tribute to the Air Officer Commanding No. 11 Group, Air Vice-Marshal K. R. Park, C.B., M.C., D.F.C., for the way in which he adjusted his tactics and interception methods to meet each new development as it occurred.

Tactical control was, as has already been stated, devolved to the groups; but tactical methods were normally laid down by Command Headquarters. During periods of intense fighting, however, there was no time for consultation, and Air Vice-Marshal Park acted from day to day on his own initiative. We discussed matters as opportunity offered.

He has reported on the tactical aspects of the battle in two very interesting documents, which are, however, too long to reproduce here.

A close liaison was kept between Nos. 10 and 11 and 12 Groups. It sometimes happened that, in the heaviest attacks, practically all No. 11 Group fighters would be in the air. No. 11 Group would then ask No. 12 Group to send a formation from Duxford to patrol over the aerodromes immediately east of London so that these might not be attacked when defenceless.

Mutual help was also arranged between Nos. 10 and 11 Groups. When Portsmouth was attacked, for instance, No. 10 would help No. 11 Group, and vice versa when the attack was on Portland or some convoy to the west of the Isle of Wight.

The amount of physical damage done to convoys during the first phase was not excessive. About five ships (I think) were actually sunk by bombing, others were damaged, and convoys were scattered on occasion. It was, of course, much easier to protect the convoys if they kept as close as possible to the English coast, but one convoy at least was routed so as to pass close to Cherbourg, and suffered accordingly. Later, it was arranged that convoys should traverse the most dangerous and exposed stretches by night, and convoys steaming in daylight either had direct protection by fighter escorts or else had escorts at "readiness" prepared to leave the ground directly danger threatened.

Three of the radio-location stations in the South of England suffered rather severe damage and casualties. No station was permanently put out of action, and the worst damage was repaired in about a month, though the station was working at reduced efficiency in about half that time. The operating personnel, and particularly the women, behaved with great courage under threat of attack and actual bombardment.

As regards aerodromes, Manston was the worst sufferer at this stage. It, Hawkinge and Lympne were the three advanced grounds on which we relied for filling up tanks when a maximum range was required for operations over France. They were so heavily attacked with bombs and machine guns that they were temporarily abandoned. This is not to say that they could not have been used if the need had been urgent, but, for interception at or about our own coastline, aerodromes and satellites farther inland were quite effective.

Heavy damage was done to buildings, but these were mostly non-essential, because aircraft were kept dispersed in the open, and the number of men and women employed was not large in comparison with the number at a station which was the headquarters of a sector.

Works personnel, permanent and temporary, and detachments of Royal Engineers were employed in filling up the craters on the aerodromes. Experience at this stage showed that neither the personnel nor the material provided were adequate to effect repairs with the necessary

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speed, and the strength and mobility of the repair parties were increased. Stocks of "hard-core" rubble had been collected at fighter aerodromes before the war.

138. It may be convenient here to continue the subject of damage to fighter stations other than those attacked in the first phase.

Casualties to personnel were slight, except in cases where a direct hit was made on a shelter trench. The trenches commonly in use were lined with concrete and were roofed and covered with earth; but they gave no protection against a direct hit, and, in the nature of things, they had to be within a short distance of the hangars and offices.

Only non-essential personnel took cover; aircraft crews and the staff of the operations room remained at their posts. The morale of the men and women of ground crews and staffs was high and remained so throughout.

At Kenley and at Biggin Hill direct hits were sustained on shelter trenches, at the latter place by a bomb of 500 kilog. or more. The trench and its forty occupants were annihilated.

Wooden hangars were generally set on fire by a bombing attack, and everything in them destroyed.

Steel, brick and concrete hangars, on the other hand, stood up well against attack, though, of course, acres of glass were broken. Hangars were generally empty or nearly so, and those aircraft which were destroyed in hangars were generally under repair or major inspection which made it necessary to work under cover.

It must, nevertheless, be definitely recorded that the damage done to fighter aerodromes, and to their communications and ground organization, was serious, and has been generally under-estimated. Luckily, the Germans did not realize the success of their efforts, and shifted their objectives before the cumulative effect of the damage had become apparent to them.

Damage to aerodrome surface was not a major difficulty. It was possible for the Germans to put one or two aerodromes like Manston and Hawkinge out of action for a time, but we had so many satellite aerodromes and landing grounds available that it was quite impossible for the Germans to damage seriously a number of aerodromes sufficient to cause more than temporary inconvenience.

This is an important point, because, in mobile warfare, fighter aerodromes cannot be hastily improvised in broken country, and the number of aerodromes actually or potentially available is a primary factor in the "appreciation of a situation."

Sector operations rooms were protected by high earth embankments, so that they were immune from everything except a direct hit, and, as a matter of fact, no direct hit by a heavy bomb was obtained on any operations room. Communications were, however, considerably interrupted, and I must here pay a tribute to the foresight of Air Vice-Marshal E. L. Gossage, C.B., C.V.O., D.S.O., M.C., who commanded No. 11 Group during the first eight months of the war. At his suggestion "stand-by" operations rooms were constructed at a distance of two or three miles from sector headquarters and a move was made to these when serious attacks on fighter aerodromes began. They were somewhat inconvenient makeshifts, and some loss of efficiency in interception resulted from their use. Work was put in hand immediately on more permanent and fully equipped operations rooms conveniently remote from sector headquarters; these, though in no way bomb-proof, were outside the radius of anything aimed at the sector aerodrome and owed their immunity to inconspicuousness. Most of these were finished by October, 1940.

Aerodrome defence against parachute troops, or threat of more serious ground attack, was an important and a difficult problem, because Home Defence troops were few and were needed on the beaches, and the majority of troops rescued from Dunkirk were disorganized and unarmed. The Commander-in-Chief, Home Forces, did, however, make troops available in small numbers for the more important aerodromes, and armoured vehicles were extemporised. The difficulty was enhanced by a comparatively recent decision of the Air Ministry to disarm the rank and file of the Royal Air Force. The decision was reversed, but it was some time before rifles could be provided and men trained in their use.

The slender resources of Anti-Aircraft Command were strained to provide guns for the defence of the most important fighter and bomber aerodromes. High-altitude and Bofors guns were provided up to the limit considered practicable, and the effort was reinforced by the use of Royal Air Force detachments with Lewis guns and some hundreds of 20-mm. cannon which were not immediately required for use in aircraft.

A type of small rocket was also installed at many aerodromes. These were arranged in lines along the perimeter, and could be fired up to a height of something under 1,000 feet in the face of low-flying atttack. They carried a small bomb on the end of a wire. Some limited success was claimed during a low-flying attack at Kenley and they probably had some moral effect when

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their existence became known to the enemy. They were, of course, capable of physical effect only against very low horizontal attacks.

The main safeguard for aircraft against air attack was dispersal. Some experiments on Salisbury Plain in the summer of 1938 had shown that dispersal alone, without any form of splinter-proof protection, afforded a reasonable safeguard against the forms of attack practised by our own Bomber Command at the time. Thirty unserviceable fighters were disposed in a rough ring of about 1,000 yards diameter, and Bomber Command attacked them for the inside of a week with every missile between a 500-lb. bomb and an incendiary bullet, and without any kind of oppositon. The result was substantially: three destroyed, one damaged beyond repair, eleven seriously damaged but repairable, and the rest slightly damaged or untouched.

I therefore asked that small splinter-proof pens for single aircraft should be provided at all fighter aerodromes. This was not approved, but I was offered pens for groups of three. I had to agree to this, because it was linked up with the provision of all-weather runways which I had been insistently demanding for two years, and it was imperatively necessary that work on the runways should not be held up by further discussion about pens. I think that the three-aircraft pens were too big. They had a large open face to the front and a concrete area, of the size of two tennis courts, which made an ideal surface for the bursting of direct-action bombs. Eventually, splinter-proof partitions were made inside the pens, and till then some aircraft were parked in the open. Losses at dispersal points were not serious; the worst in my recollection was five aircraft destroyed or seriously damaged in one attack. Small portable tents were provided which could be erected over the centre portion of an aeroplane, leaving the tail and wing-tips exposed. These protected the most important parts and enabled ground crews to work in bad weather.

About this time an improvised repair system was organized and worked well. With the hearty co-operation of the Ministry of Aircraft Production it was decided that units should be relieved of all extensive repairs and overhauls, both because of their preoccupation in the battle and because of the danger of further damage being done by enemy action to aircraft under repair. Broadly speaking, any aircraft capable of returning to its base was capable of another fifteen minutes' straight flight to a repair depot; aircraft incapable of flight were sent by road. Small repairs, such as the patching of bullet holes, were done by the unit. Two such repair depots were improvised about thirty miles to the west of London, and this undoubtedly prevented an accumulation of unserviceable aircraft at fighter stations.

It was also about this time that the final decision was made to relegate the Defiant to night operations. It had two serious disabilities: firstly, the brain flying the aeroplane was not the brain firing the guns: the guns could not fire within 16 degrees of the line of flight of the aeroplane and the gunner was distracted from his task by having to direct the pilot through the communication set. Secondly, the guns could not be fired below the horizontal, and it was therefore necessary to keep below the enemy. When beset by superior numbers of fighters the best course to pursue was to form a descending spiral, so that one or more Defiants should always be in a position to bring effective fire to bear. Such tactics were, however, essentially defensive, and the formation sometimes got broken up before they could be adopted. In practice the Defiants suffered such heavy losses that it was necessary to relegate them to night fighting, or to the attack of unescorted bombers.

The above remarks have carried me beyond the first phase of the battle and into the second; but I find it impossible to adhere to a description of the fighting phase by phase. The enemy's strategical, as well as his tactical, moves had to be met from day to day as they occurred, and I give an account of my problems and the lessons to be derived from them roughly in the order of their incidence. The detailed sequence of events is sufficiently indicated in the diagram at Appendix "D."

Throughout the battle, of course, fighting continually occurred over the sea, and German aircraft damaged over England had to return across the Straits of Dover or the English Channel. Far more German than British crews fell into the sea. The Germans therefore developed an elaborate system of sea-rescue. Their bombers had inflatable rubber dinghies, and various other rescue devices were adopted. Crews were provided with bags of a chemical known as fluorescine, a small quantity of which stained a large area of water a vivid green. Floating refuges with provisions and wireless sets were anchored off the French coast. E-boats and rescue launches were extensively employed, and white-painted float-planes, marked with the Red Cross, were used even in the midst of battle. We had to make it known to the Germans that we could not countenance the use of the Red Cross in this manner. They were engaged in rescuing combatants and taking them back to fight again, and

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they were also in a position, if granted immunity, to make valuable reconnaissance reports. In spite of this, surviving crews of these aircraft appeared to be surprised and aggrieved at being shot down.

Our own arrangements were less elaborate. Life-saving jackets were painted a conspicuous yellow, and later the fluorescine device was copied. Patrol aircraft (not under the Red Cross) looked out for immersed crews, and a chain of rescue launches with special communications was installed round the coast. Our own shipping, too, was often on the spot, and many pilots were rescued by naval or merchant vessels.

This is perhaps a convenient opportunity to say a word about the ethics of shooting at aircraft crews who have baled out in parachutes.

Germans descending over England are prospective prisoners of war and, as such, should be immune. On the other hand, British pilots descending over England are still potential combatants.

Much indignation was caused by the fact that German pilots sometimes fired on our descending airmen (although, in my opinion, they were perfectly entitled to do so), but I am glad to say that in many cases they refrained and sometimes greeted a helpless adversary with a cheerful wave of the hand.

Many of the targets attacked during the first two phases of the battle were of little military importance, and had but slight effect on our war effort. Exceptions to this were day attacks carried out on the Spitfire works at Southampton and the sheds at Brooklands, where some of our Hurricanes were assembled and tested. Both these attacks had some effect on output which would have been serious but for the anticipatory measures taken by Lord Beaverbrook.

About this time one Canadian, two Polish and one Czech squadrons became fit for operations.

A squadron of Canadian pilots of the Royal Air Force (No. 242) had been in existence for some months, and was one of the squadrons which went to France in June to cover the evacuation from the west coast. On its return it became one of the foremost fighting squadrons in the Command, under the leadership of the very gallant Squadron Leader (now Wing Commander) D. R. S. Bader, D.S.O., D.F.C., No. 1 (Canadian) Squadron, now also came into the line and acquitted itself with great distinction.

I must confess that I had been a little doubtful of the effect which their experience in their own countries and in France might have had upon the Polish and Czech pilots, but my doubts were soon laid to rest, because all three squadrons swung into the fight with a dash and enthusiasm which are beyond praise. They were inspired by a burning hatred for the Germans which made them very deadly opponents. The first Polish squadron (No. 303) in No. 11 Group during the course of a month shot down more Germans than any British unit in the same period. Other Poles and Czechs were used in small numbers in British squadrons, and fought very gallantly, but the language was a difficulty, and they were probably most efficiently employed in their own national units. Other foreign pilots were employed in British squadrons, but not in appreciable numbers. The American "Eagle" Squadron was in process of formation during the battle.

The Auxiliary squadrons were by this time practically indistinguishable from Regulars. It will be remembered that the Scottish Auxiliaries were responsible for the first air success of the war in the Firth of Forth. To set off against the discontinuity of their training in peace time they had had the great advantage of permanency of personnel, and the flight commanders at the outbreak of the war were senior and experienced. At the same time, this very permanence led to the average age of the pilots being rather high for intensive fighting, which exercises a strain which the average man of 30 cannot support indefinitely. This point has now ceased to be of importance because of fresh postings. It is mentioned only because it is a factor to be kept in mind in peace time. No praise can be too high for the Auxiliaries, both as regards their keenness and efficiency in peace time and their fighting record in war.

I may perhaps mention the question of the long-range guns which were mounted along the coast of France near Cap Grisnez. They were within range of our coastal aerodromes, which they occasionally subjected to a desultory shelling. Their main targets, however, were Dover and the convoys passing through the Straits. So far as I am aware, neither they nor the guns which we installed as counter-measures had any great influence on the air fighting, but they did, of course, make it impossible for any of our warships to approach the French coast in clear weather, and might have had an important effect if it had been possible for the Germans to launch an invading army.

About the end of the second phase the problems of keeping units up to strength and of relieving them when exhausted began to assume formidable proportions. It was no new experience, because the drain of units and pilots to

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France, coupled with the Dunkirk fighting, had created similar problems in the spring.

The comparative relaxation in the intensity of the fighting in June and July had afforded a little respite, but units had only partially recovered and were neither fresh nor up to strength when the fighting again became intense.

When squadrons became exhausted obviously the most satisfactory way of reinforcement was by means of moving complete units, and this was done when time allowed. Serviceable aircraft were transferred by air, and operational aircraft crews (about thirty-five men per squadron) were transferred by civil aircraft put at my disposal for the moves. The remainder of the personnel travelled by train or motor transport according to circumstances. Some of the distances involved were considerable, as for instance when a squadron from Wick had to be brought down in the London Area.

The first-line strength of a squadron was sixteen aircraft, of which not more than twelve were intended to be operationally available at any one time. The other four would normally be undergoing inspection or overhaul. In addition to this, there was a small reserve of three to five aircraft per squadron available on the station.

There was a limit to the number of trained pilots which could be kept on the strength of a squadron even in times of operational passivity, because not more than about twenty-five could be kept in full practice in flying duties.

A fresh squadron coming into an active sector would generally bring with them sixteen aircraft and about twenty trained pilots. They would normally fight until they were no longer capable of putting more than nine aircraft into the air, and then they had to be relieved. This process occupied different periods according to the luck and skill of the unit. The normal period was a month to six weeks, but some units had to be replaced after a week or ten days.

Air Vice-Marshal Park found that the heaviest casualties were often incurred by newly arrived squadrons owing to their non-familiarity with the latest developments of air fighting.

It soon became impossible to maintain the to-and-fro progress of complete unit personnel from end to end of the country, and the first limitation to efficiency which had to be accepted was the retention of the majority of personnel at sector stations and the transfer only of flying personnel and aircraft crews. This limitation was regrettable because it meant that officers and men were strange to one another, but worse was to come.

By the beginning of September the incidence of casualties became so serious that a fresh squadron would become depleted and exhausted before any of the resting and re-forming squadrons was ready to take its place. Fighter pilots were no longer being produced in numbers sufficient to fill the gaps in the fighting ranks. Transfers were made from the Fleet Air Arm and from Bomber and Coastal Commands, but these pilots naturally required a short flying course on Hurricanes or Spitfires and some instruction in formation flying, fighter tactics and interception procedure.

I considered, but discarded, the advisability of combining pairs of weak units into single squadrons at full strength for several reasons, one of which was the difficulty of recovery when a lull should come. Another was that ground personnel would be wasted, and a third was that the rate at which the strength of the Command was decreasing would be obvious.

I decided to form three categories of squadron:

(*a*) The units of No. 11 Group and on its immediate flanks, which were bearing the brunt of the fighting.

(*b*) A few outside units to be maintained at operational strength and to be available as unit reliefs in cases where this was unavoidable.

(*c*) The remaining squadrons of the Command, which would be stripped of their operational pilots, for the benefit of the "A" squadrons, down to a level of five or six. These "C" squadrons could devote their main energies to the training of new pilots, and, although they would not be fit to meet German fighters, they would be quite capable of defending their sectors against unescorted bombers, which would be all that they would be likely to encounter.

The necessity for resorting to such measures as these indicates the strain which had been put on Fighter Command and the pilot training organizations by the casualties which the Command had suffered in this decisive battle.

In the early stages of the fight Mr. Winston Churchill spoke with affectionate raillery of me and my "chicks." He could have said nothing to make me more proud; every chick was needed before the end.

I trust that I may be permitted to record my appreciation of the help given me by the support and confidence of the Prime Minister at a difficult and critical time.

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In the early days of the war the question of the provision of operational training units (or group pools, as they were called at that time) was under discussion. It was referred to in the correspondence which I have mentioned in paragraph 17 of this despatch. At that time I was so gravely in need of additional fighter squadrons that I was willing to do without group pools altogether while we were still at long range from the German fighters.

The functions of these group pools, or O.T.Us., was to accept pilots direct from flying training schools or non-fighter units of the Royal Air Force and train them in the handling of fighter types, formation flying, fighting tactics, and R/T control and interception methods. I realized that the fighters in France could not undertake this work and must have a group pool allotted primarily to meet their requirements, but I felt that, so long as we at home were out of touch with German fighters, I would prefer to put all available resources into new squadrons and to undertake in service squadrons the final training of pilots coming from flying training schools, provided that they had done some formation flying and night flying, and had fired their guns in the air.

Of course, when intensive fighting began, final training of pilots in squadrons could no longer be given efficiently, and at the time of the battle three O.T.Us. were in existence. It was found that three weeks were about the minimum period which was of practical value, but that a longer course, up to six weeks, was desirable when circumstances permitted.

During the battle the output from the O.T.Us. was quite inadequate to meet the casualty rate, and it was not even possible to supply from the flying training schools the necessary intake to the O.T.Us.

The lack of flexibility of the training system, therefore, proved to be the bottleneck and was the cause of the progressively deteriorating situation of Fighter Command up till the end of September. This statement is in no sense a criticism of Flying Training Command. The problem, as I state it here, can have no ideal solution and some compromise must be adopted.

Assuming that in periods of maximum quiescence the fighter squadrons of the Royal Air Force require an intake of "x" pilots per week, in periods of intense activity they require about ten times the number.

It is necessary to start the flying training of a pilot about a year before he is ready to engage enemy fighters, and therefore the training authorities should be warned, a year ahead, of the incidence of active periods. This is obviously impossible. If they try to be ready for all eventualities by catering for a continuous output to meet a high casualty rate, the result is that, during quiet periods, pilots are turned out at such a rate that they cannot be absorbed, or even given enough flying to prevent their forgetting what they have been taught. If, on the other hand, they cater for the normal wastage rate, fighter squadrons are starved of reinforcements when they are most vitally needed.

The fundamental principle which must be realized is that fighter needs, when they arise, are not comparative with those of other Commands, but absolute. An adequate and efficient fighter force ensures the security of the base, without which continuous operations are impossible.

If the fighter defence had failed in the autumn of 1940, England would have been invaded. The paralysis of their fighters in the spring was an important factor in the collapse of the French resistance. Later, the unavoidable withdrawal of the fighters from Crete rendered continued resistance impossible.

Day bomber and Army co-operation aircraft can operate when their own fighters are predominant, but are driven out of the sky when the enemy fighters have a free hand.

I submit some suggestions by which the apparently insuperable difficulties of the problem may be reduced:

(*a*) Start by aiming at a fighter output well above that needed in quiescent periods.

(*b*) Ensure that at flying training schools pupils earmarked for other duties may be rapidly switched over to fighter training.

(*c*) Organize the O.T.Us. with a "normal" and an "emergency" syllabus, the latter lasting for three weeks and the former twice as long.

(*d*) Fill up the service fighter squadrons to a strength of twenty-five pilots, or whatever the C.-in-C. considers to be the maximum which can be kept in flying and operational practice.

(*e*) Form reservoirs, either at O.T.Us. or in special units, where surplus pilots may maintain the flying and operational standard which they have reached.

(*f*) When the initiative lies in our hands (as, for instance, when we are planning to deliver an offensive some time ahead), the intake of flying training schools should be adjusted to cater for the additional stress which can be foreseen.

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(*g*) (and this applies principally to overseas theatres of war where rapid reinforcement is impossible). Let the day bomber and Army co-operation squadrons have a number of fighters on which they can fly and train as opportunity offers. This is a revolutionary suggestion, but it is made in all seriousness. If their fighters are overwhelmed the day bomber and Army co-operation units will not be able to operate at all. No very high standard of training should be attempted, especially in radio-controlled interception methods; but the intervention of these units as fighters, working in pairs or small formations, might well prove to be the decisive factor in a critical situation.

It will be observed that, at the end of the second phase of the battle, the power of reinforcing by complete units had substantially disappeared. We still possessed an effective reserve of trained pilots, but they could be made available only by stripping the squadrons which were not engaged in the South and South-East of England.

The effective strength of the Command was running down, though the fact was not known to the public nor, I hoped, to the Germans. They for their part must certainly be feeling the effect of their heavy losses, but there was very little indication of any loss of morale, so far as could be seen from a daily scrutiny of the examinations of prisoners of war. Our own pilots were fighting with unabated gallantry and determination.

The confidence of the German High Command probably received something of a shock about this time. The sustained resistance which they were meeting in South-East England probably led them to believe that fighter squadrons had been withdrawn, wholly or in part, from the North in order to meet the attack. On 15th August, therefore, two large raids were sent, one to Yorkshire and one to Newcastle. They were escorted by fighters. The distance was too great for Me.109's, but not for Me.110's.

If the assumption was that our fighters had been withdrawn from the North, the contrary was soon apparent, and the bombers received such a drubbing that the experiment was not repeated. I think that this incident probably had a very depressing influence on the outlook of the German High Command.

As I have said, our own pilots were fighting with the utmost gallantry and determination, but the mass raids on London, which were the main feature of the third phase of the battle, involved a tremendous strain on units which could no longer be relieved as such. Some squadrons were flying fifty or sixty hours per diem.

Many of the pilots were getting very tired. An order was in existence that all pilots should have twenty-four hours' leave every week, during which they should be encouraged to leave their station and get some exercise and change of atmosphere; this was issued as an order so that the pilots should be compelled to avail themselves of the opportunity to get the necessary rest and relaxation. I think it was generally obeyed, but I fear that the instinct of duty sometimes over-rode the sense of discipline. Other measures were also taken to provide rest and relaxation at stations, and sometimes to find billets for pilots where they could sleep away from their aerodromes.

During this third phase, the problem arose, in an acute form, of the strength of fighter formations which we should employ. When time was the essence of the problem, two squadrons were generally used by Air Vice-Marshal Park in No. 11 Group. He had the responsibility of meeting attacks as far to the eastward as possible, and the building up of a four-squadron formation involved the use of a rendezvous for aircraft from two or more aerodromes. This led to delay and lack of flexibility in leadership.

On the other hand, when No. 12 Group was asked to send down protective formations to guard the aerodromes on the eastern fringe of London, it was often possible to build up big formations, and these had great success on some occasions, though by no means always.

Because a similar situation may well arise in future, I think that it is desirable to enter into some detail in this connection.

I may preface my remarks by stating that I am personally in favour of using fighter formations in the greatest strength of which circumstances will permit, and, in the Dunkirk fighting, where we could choose our time and build up our formations on the outward journey, I habitually employed four-squadron formations as a preferable alternative to using two-squadron formations at more frequent intervals; but, during the attacks on London, the available strength of fighters did not admit of this policy, nor was time available.

I quote from Air Vice-Marshal Park's report:

"The general plan adopted was to engage the enemy high-fighter screen with pairs of Spitfire squadrons from Hornchurch and Biggin Hill half-way between London and the

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coast, and so enable Hurricane squadrons from London sectors to attack bomber formations and their close escort before they reached the line of fighter aerodromes east and south of London. The remaining squadrons from London sectors that could not be dispatched in time to intercept the first wave of the attack by climbing in pairs formed a third and inner screen by patrolling along the lines of aerodromes east and south of London. The fighter squadrons from Debden, Tangmere and sometimes Northolt were employed in wings of three or in pairs to form a screen south-east of London to intercept the third wave of the attack coming inland, also to mop up retreating formations of the earlier waves. The Spitfire squadrons were redisposed so as to concentrate three squadrons at each of Hornchurch and Biggin Hill. The primary role of these squadrons was to engage and drive back the enemy high-fighter screen, and so protect the Hurricane squadrons, whose task was to attack close escorts and then the bomber formations, all of which flew at much lower altitude."

I think that, if the policy of big formations had been attempted at this time in No. 11 Group, many more bombers would have reached their objectives without opposition.

Air Vice-Marshal Park also quotes the results of the ten large formations ordered from Duxford into No. 11 Group in the last half of October, when the Germans were employing fighter types only. Nine of these sorties made no interception, and the tenth destroyed one Me.109.

The most critical stage of the battle occurred in the third phase. On 15th September the Germans delivered their maximum effort, when our guns and fighters together accounted for 185 aircraft. Heavy pressure was kept up till 27th September, but, by the end of the month, it became apparent that the Germans could no longer face the bomber wastage which they had sustained, and the operations entered upon their fourth phase, in which a proportion of enemy fighters themselves acted as bombers.

This plan, although the actual damage caused by bombs was comparatively trivial, was aimed primarily at a further whittling down of our fighter strength, and of all the methods adopted by the Germans it was the most difficult to counter. Apart from the previous difficulty of determining which formations meant business and which were feints, we had to discover which formations carried bombs and which did not.

To meet this difficulty, Air Vice-Marshal Park devised the plan of using single Spitfires, flying at maximum height, to act as reconnaissance aircraft and to report their observations immediately by R/T.

A special flight was organized for this purpose, and it was later recommended that the Spitfires should be employed in pairs, for reasons of security, and that the flight should become a squadron. A special R/T receiving set was erected at group headquarters so that reports might be obtained without any delay in transmission from the sector receiving station. There is reason to believe that the Germans also adopted a system of using high-flying He. 113's as scouts. Their information concerning our movements was transmitted to the ground and relayed to their bombers in the air.

In the fourth phase the apparent ratio of losses in our favour dropped appreciably. I say "apparent," because, in fighting at extreme altitudes, fighters often could not see their victims crash, and the percentage reported as certainly destroyed was unfairly depressed. Our own casualties, nevertheless, were such that the "C" category squadrons, which I was hoping to build up to operational strength again, remained in their conditon of semi-effectiveness.

Serious as were our difficulties, however, those of the enemy were worse, and by the end of October the Germans abandoned their attempts to wear down Fighter Command, and the country was delivered from the threat of immediate invasion.

The order of battle at the beginning of November is shown at Appendix "E." Categories of squadrons ("A," "B" or "C," *vide* paragraph 177) are indicated.

Increasingly throughout the battle had the importance of a high "ceiling" been manifested. It is by no means necessary that every fighter shall have its best performance at stratospheric heights; any such policy would result in a loss of performance at lower altitude, and we must never lose sight of the basic principle that the fighter exists for the purpose of shooting down bombers, and that its encounters with other fighters are incidental to this process.

There are, nevertheless, arguments for giving to a percentage of fighters a ceiling (determinable by specific physiological tests) above which no enemy can climb without the use of pressure cabins. Just as the "weather gauge" was often the determining factor in the tactics of sailing ships so the "height gauge" was often crucial in air combat. Exhaust-driven turbo-superchargers have certain advantages over gear-driven blowers at great height, and should be considered for adoption in spite of their disadvantages.

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It must be remembered also that the initiative always rests with the bomber, who can select at will the height at which he will make his attack. We must be prepared, therefore, for the appearance of the pressure-cabin bomber, flying at a height unattainable by any non-pressurized fighter. (I should perhaps explain that there is a height, about 43,000 feet, above which the administration of any quantity of oxygen at atmospheric pressure becomes ineffective because it cannot be inhaled and a pressure cabin or a pressure suit becomes essential.) Of course, a pressure-cabin bomber is inefficient and vulnerable, because it is difficult to operate free guns from a pressure cabin, and pressure leakage from holes made in the walls of the cabin will prostrate the crew. The threat from pressurized bombers is therefore serious only if we have no fighters to meet them, and for this reason we should always possess a limited number of pressurized fighters.

Various other lessons were learned from the experience of fighting at extreme altitudes. One very tiresome feature was that a considerable proportion of ultra-high-flying raids was missed by the intelligence systems, or reported so late that time was not available to climb and intercept. This made it necessary to employ standing patrols just below oxygen height (about 16,000 feet). These patrols climbed to intercept at extreme height when ordered to do so. This cut at the roots of the Fighter Command system, which was designed to ensure economy of effort by keeping aircraft on the ground except when required to make an interception.

Another lesson was that the system of using an "above guard" should be retained even when an attack was initiated from extreme altitude.

Flying and fighting fatigue increases with altitude, and the comfort of the pilot requires unremitting attention. Cockpit heating and the meticulous pursuit and elimination of air leaks are of great importance. Attention should also be paid to the elimination of icing on cockpit hoods (which are apt to freeze immovably) and on the inside and outside of windscreens.

A serious handicap, which I have not hitherto mentioned, was the fact that the change-over from "high frequency" to "very high frequency" radio-telephony was still in progress. The V.H.F. was an immense improvement on the H.F., both in range and clarity of speech; but the change-over, which had started nearly a year before, was held up by the slow output of equipment. This meant that much work had to be done on aircraft radio equipment during the battle, and squadrons equipped with V.H.F. could not communicate with H.F. ground stations, and vice versa.

Some of our worst losses occurred through defective leadership on the part of a unit commander, who might lead his pilots into a trap or be caught while climbing by an enemy formation approaching "out of the sun." During periods of intense activity promotions to the command of fighter squadrons should be made on the recommendation of group commanders from amongst flight commanders experienced in the methods of the moment. If and when it is necessary to post a squadron leader (however gallant and experienced) from outside the Command, he should humbly start as an ordinary member of the formation until he has gained experience. Only exceptionally should officers over 26 years of age be posted to command fighter squadrons.

The experience of the battle made me a little doubtful if the organization of a squadron into two flights each of two sections of three aircraft was ideal. It was, of course, undesirable to make any sweeping change during the battle, and I relinquished my command shortly after its termination; but the weakness lay in the section of three when it became necessary to break up a formation in a "dog fight." The organization should allow for a break-up into pairs, in which one pilot looks after the tail of his companion. A squadron might be divided into three flights of four (which would limit the employment of half-squadrons), or it might consist of two flights of eight, each comprising two sections of four. This latter suggestion would upset standard arrangements for accommodation.

The matter is not one which can be settled without consultation with various authorities and branches of the Air Ministry. I therefore merely raise the point without making any definite recommendation.

A great deal of discussion took place before and in the early stages of the war as to the best method of "harmonization" of the guns of an eight-gun fighter: that is to say, the direction, in relation to the longitudinal axis of the aircraft, in which each gun should be pointed in order to get the best results.

There were three schools of thought:

One maintained that the lines of fire should be dispersed so that the largest possible "beaten zone" might be formed and one gun (but not more than one) would always be on the target.

The second held that the guns should be left parallel and so would always cover an elongated zone corresponding with the vulnerable

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parts of a bomber (engines, tanks and fuselage).

The third demanded concentration of the fire of all guns at a point.

Arguments were produced in favour of all three methods of harmonization, but in practice it was found that concentration of fire gave the best results. Guns were harmonized so that their lines of fire converged on a point 250 yards distant: fire was therefore effective up to about 500 yards, where the lines of fire had opened out again to their original intervals after crossing at the point of concentration.

It was very desirable to get data as to the actual ranges at which fire effect had been obtained. The reflector sight contained a rough range-finder which the range of an aircraft of known span could be determined if it was approached from astern, but, in spite of this, pilots, in the heat of action, generally under-estimated the ranges at which they fired.

Cinemas guns, invaluable for training purposes, were used in combat also; and many striking pictures were obtained, from which valuable lessons were learned.

The types of ammunition used in the guns varied during the course of the battle. It was necessary to include some incendiary ammunition, but the type originally available gave a distinct smoke-tracer effect. Now tracer ammunition in fixed guns at any but very short range gives very misleading indications, and I wished pilots to use their sights properly and not to rely on tracer indications. (The above remarks do not apply at night, nor to free guns, where tracer is essential for one of the methods taught for aiming.)

During the battle "de Wilde" ammunition became available in increasing quantities. This was an incendiary ammunition without any flame or smoke trace, and it was extremely popular with pilots, who attributed to it almost magical properties. Eight-gun fighters, of course, were always liable to be sent up at night, and it was therefore desirable to retain some of the older types of incendiary bullets. These were preferred to the tracer proper, which gave too bright a flame at night.

A typical arrangement, therefore, was:

Old-type incendiary in the two outer guns.

de Wilde in one gun while supplies were limited.

Armour-piercing in two guns, and ball in the other three.

A discussion on the offensive and defensive equipment of aircraft will be found at Appendix "F." It will be of interest to all concerned with the design of technical equipment of aircraft.

PART III.—NIGHT INTERCEPTION

No story of the battle would be complete without some account of the night operations. It is true that they constituted only a subsidiary activity in comparison with the main German objective of fighting us to a standstill by day so that air superiority might be attained as a preliminary to invasion. The night attacks did little directly to affect the efficiency of the day fighting squadrons, though they had certain indirect effects. Although actual casualties were insignificant, disturbance and loss of sleep were caused; damage was done to factories where aircraft engines and accessories were produced; and the stress of continuous operations, day and night, imposed a very heavy strain on formation commanders and staff officers, and upon the personnel of all operations rooms.

I had long been apprehensive of the effect of night attacks, when they should begin, and of the efficacy of our defensive measures.

We relied on day-time interception methods, and on the searchlights to illuminate and hold the bombers. If they were capable of doing this, all would be well, since the distance at which an illuminated bomber can be seen by night is comparable with the range of visibility by daylight.

The first night attack worthy of the name was made early in June and the results were encouraging. Aircraft were well picked up and held by the searchlights and six were shot down. The attack was, however, made at comparatively low altitudes (8,000 to 12,000 feet), and the Germans, profiting by this lesson, resorted thereafter to greater heights at which the searchlights were practically ineffective. In close consultation with myself, General Pile tried every conceivable method of operation, but without material success.

About this time radio-location instruments were fitted in Blenheims and it became necessary to develop at high pressure a system of operation which should enable night fighters to make interceptions even against unilluminated targets.

The difficulty of this task will be realized when it is considered that it became necessary to put the fighter within one or two hundred yards of the enemy, and on the same course, instead of the four or five miles which were adequate against an illuminated target.

It may be asked why the searchlights were so comparatively impotent when they had afforded an accessory to successful defence at the

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end of the last war. The answer lies partly in the height factor already discussed, and partly in the greatly increased speed of the bomber, which was about three times that obtaining in 1914. The sound locater, on which searchlights mainly relied at this time, naturally registered the apparent position of the source of sound and lagged behind the target to the extent of the time taken by sound to travel from the target to the sound locator. When the speed of the target is low it is comparatively easy to allow for this lag, but at the speeds of modern bombers the angular distance which must be allowed for in searching is so great that the searchlights were generally defeated.

The first thing which appeared obvious to me was that a "sound plot" track transmitted from the Observer Corps with a variable and unpredictable "lag" was good enough only for air-raid warning purposes and was much too inaccurate to be of use for controlled interception at night: height indications also were little better than guesswork. The radio-location apparatus (known as A.I.) fitted in twin-engined fighters had a maximum range of two or three miles, but it was limited by the height at which the fighter was flying. If, for instance, the fighter was flying at 10,000 feet, ground echoes were reflected from all ranges greater than this, and an aircraft echo from 10,500 feet would be indistinguishable among the ground echoes.

The minimum range of the A.I. was also restricted at this time to about 1,000 feet. Below this distance the aircraft echo was swamped by instrumental disturbance. Continuous and intensive development work was in progress to minimize these limitations.

No radio-location apparatus was available at this time for inland tracking, and I turned for help to the Army, which had developed for use with guns a radio-location apparatus known as the G.L. set. Within a limited range (about 40,000 feet) this set could give very accurate position plots, and, moreover, could read height to within plus or minus 1,000 feet at average ranges.

Although these sets were few in number and were urgently required for their original purpose of gun control, General Pile realized the urgency of our need and made available about ten sets for an experiment in the Kenley sector on the usual line of approach of London raiders, which commonly made their landfall near Beachy Head.

The G.L. sets were installed at searchlight posts, and direct telephone communication was arranged with the Kenley sector operations room. Here a large blackboard was installed, and the G.L. plots were shown at intervals of about thirty seconds and with a greater accuracy in height than had before been possible by any means.

The track of the pursuing fighter was determined by means of the R/T direction-fianding stations.

Major A. B. Russell, O.B.E., T.A.R.O., co-operated in the development of this system in the Kenley sector. His practical knowledge and tireless enthusiasm were of the greatest value.

Promising results were obtained almost from the first and numerous instances occurred where echoes were obtained on the A.I. sets in the aircraft. Practical results were, however, disappointing, partly because the A.I. apparatus proved to be unexpectedly capricious in azimuth, and partly because the Blenheim was slower than many of the German bombers and was deficient in fire power. Many Germans escaped after an initial A.I. "pick-up" and even after visual contact had been effected.

The A.I. apparatus was then fitted into the Beaufighters, which were just beginning to appear in service. The machines and their engines suffered from "teething trouble" to an unusual degree, and the adaption of A.I. to a new type was accompanied by certain difficulties. In addition, they were operating from a wet aerodrome at Redhill, and the development of delicate electrical apparatus, combined with a new type of aircraft and engine, with rudimentary maintenance facilities, was a matter of the greatest difficulty. In nine cases out of ten something would go wrong with the aeroplane or with the A.I. set or with the R/T direction-finding apparatus or with the communication system before an interception could be made. No. 219 Squadron, under Squadron Leader J. H. Little, were engaged in this work and operated with great energy and enthusiasm under extremely adverse and difficult conditions.

It would, of course, have been desirable to carry out all this development work by day when faults would have been much more easily detected and remedied, but the low rate of aircraft serviceability precluded day and night work, and London was being bombed almost every night, so that I could not afford to neglect the chance of getting practical results. These, though disappointing, were not entirely negligible; several bombers were shot down in this area during the experimental period, and many discovered that they were pursued and turned back before reaching their objectives. Night fighting development work was also going on at the same time at the fighter interception unit at Tangmere in Sussex.

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A supplementary use was found for the A.I. by the installation of A.I. "beacons" in the vicinity of night flying aerodromes. These afforded a valuable navigational aid for "homing" in cases where any defect occurred in the R/T direction-finding system.

Shortly before I left the Command a new piece of radio-location apparatus became available in the shape of the "G.C.I." set with the plan position indicator. This was an inland-reading set which showed the position of all aircraft within its range on a fluorescent screen as the aerial was rotated.

The main advantages of this set were that it had a longer range than the G.L. set and it was possible to track the bomber and the fighter by the same apparatus instead of following one with the G.L. and the other by R/T D/F. Moreover, it was found that in some circumstances the accuracy of the R/T D/F method was inadequate for night interceptions.

On the other hand, the accuracy of height readings by the G.C.I. apparatus was less than that obtainable with the G.L. I understand that this has now been improved.

Whatever the exact technical method of plotting positions and tracks of aircraft, the object was to place the fighter behind the bomber, and in such a position that the echo of the latter would show in the fighter's A.I. set. The fighter then tried to overtake the bomber until it became visible to the naked eye.

At that time only multi-seaters could be fitted with A.I., and therefore, concurrently with the night interception experiments, methods were tried of using the searchlights as pointers for night fighters, even if the target were out of range of the searchlight beam. Experiments were made with the searchlights in "clumps" to increase their illuminating power and the visibility of their beams to fighters at a distance.

A small radio-location set was designed to fit to the searchlight itself, so as to get over the time-lag which was such an insuperable obstacle to the use of sound locators. It is probable that if searchlights can substitute the speed of light for that of sound they may take on a new lease of useful life.

The disadvantages or relying entirely on radio-controlled methods of night interception is that "saturation point" is quickly reached, and when mass raids are in progress only a limited number of fighters can be operated. Results obtained in the spring of 1941 show that day fighters can obtain important results in conditions of good visibility, especially if attention is paid to all methods of improving the night vision of pilots.

During the battle the "intruder" system was initiated on a small scale. Night fighters without A.I. were sent across to France in an attempt to catch bombers while taking off from, or landing at, their aerodromes; or to intercept them at points where they habitually crossed the French coast.

I had to leave the development of night interception at a very interesting stage; but it is perhaps not too much to say that, although much remained to be done, the back of the problem had been broken. The experiments had, of course, been carried out in a small area, and raiders which avoided the area could be intercepted only by previously existing methods; but the possibilities had been demonstrated and could be applied on a larger scale as soon as the necessary apparatus was provided.

The method is, of course, also applicable to the day interception of raiders, making use of cloud cover, which have hitherto proved extremely elusive; and it is not too much to hope that the eventual development of very high-frequency A.I. may enable accurate fire to be opened against unseen targets so that not even the darkest night nor the densest cloud will serve as a protection to the raider.

The day may come when every single-seater fighter is fitted with A.I., but this is not yet feasible. What can be done is to fit all searchlights with radio-location apparatus so that every searchlight beam is a reliable pointer towards an enemy, even if the range is too great for direct illumination.* If then the fighter can be informed in addition of the height of the raider, day fighters will be able to join usefully and economically in night operations on dark nights.

*As a result of the experience gained during this period, all searchlight equipments have since been fitted with radar control. This, combined with intensified training, has made them, since 1941, extremely accurate.

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APPENDIX "A."

FIGHTER COMMAND.

Order of Battle, 8th July, 1940.

Squadron.	*War Station.*	*Type of Aircraft.*
	No. 10 GROUP.	
87	Exeter	Hurricane
213	Exeter	Hurricane
92	Pembrey	Spitfire
234	St. Eval	Spitfire
	NO. 11 GROUP.	
43	Tangmere	Hurricane
145	Tangmere	Hurricane
601	Tangmere	Hurricane
FIU Unit	Tangmere	Blenheim
64	Kenley	Spitfire
615	Kenley	Hurricane
245	Hawkinge	Hurricane
111	Croydon	Hurricane
501	Croydon.	Hurricane
600	Manston	Blenheim
79	Biggin Hill	Hurricane
610	Gravesend	Spitfire
32	Biggin Hill	Hurricane
54	Rochford	Spitfire
65	Hornchurch	Spitfire
74	Hornchurch	Spitfire
56	North Weald	Hurricane
25	Martlesham	Blenheim
151	North Weald	Hurricane
1	Northolt	Hurricane
604	Northolt	Blenheim
609	Northolt	Spitfire
236	Middle Wallop	Blenheim
	No. 12 GROUP.	
19	Duxford	Spitfire
264	Duxford	Defiant
85	Debden	Hurricane
17	Debden	Hurricane
29	Digby	Blenheim
611	Digby	Spitfire
46	Digby	Hurricane
23	Wittering	Blenheim
266	Wittering	Spitfire
229	Wittering	Hurricane
66	Coltishall	Spitfire
253	Kirton-in-Lindsey	Hurricane
222	Kirton-in-Lindsey	Spitfire
	No. 13 GROUP.	
41	Catterick	Spitfire
219	Catterick	Blenheim
152	Catterick	Blenheim
72	Acklington	Spitfire
249	Leconfield	Hurricane
616	Leconfield	Spitfire
603 "A"	Turnhouse	Spitfire
141	Turnhouse	Defiant
602	Drem	Spitfire
603 "B"	Montrose	Spitfire
3	Wick	Hurricane
504	Wick	Hurricane

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NON-OPERATIONAL SQUADRONS.

Squadron.	*War Station.*	*Type of Aircraft.*

NON-OPERATIONAL SQUADRONS.
(Forming or re-forming.)

Group.	*Squadron.*	*Aerodrome.*	*Type of Aircraft.*
10 Group	238	Middle Wallop	Hurricane
	1 (Canadian)	Middle Wallop	Hurricane
11 Group	257	Hendon	Hurricane
12 Group	242	Coltishall	Hurricane
13 Group	73	Church Fenton	Hurricane
	605	Drem	Hurricane
	607	Usworth	Hurricane
	263	Grangemouth	Hurricane

APPENDIX "E."

FIGHTER COMMAND.

Order of Battle, November 3, 1940.

NO. 9 GROUP.

Squadron.	*War Station.*	*Type of Aircraft.*	*Category.*
312 (Czech)	Speke	Hurricane	C
611	Ternhill	Spitfire	C
29 (½)	Ternhill	Blenheim	Night-Flying

NO. 10 GROUP.

79	Pembrey	Hurricane	C
87 (½)	Bibury	Hurricane	B
504	Filton	Hurricane	C
609	Middle Wallop	Spitfire	A
604	Middle Wallop	Blenheim	Night-Flying
238	Middle Wallop	Hurricane	A
56	Boscombe Down	Hurricane	A
152	Warmwell	Spitfire	A
601	Exeter	Hurricane	C
87 (½)	Exeter	Hurricane	B
234	St. Eval	Spitfire	C
247 (½)	Roborough	Gladiator	C

NO. 11 GROUP.

25	Debden	Blenheim and Beaufighter	Night-Flying
73	Castle Camp	Hurricane	Night-Flying
17	Martlesham	Hurricane	A
229	Northolt	Hurricane	A
615	Northolt	Hurricane	A
302 (Polish)	Northolt	Hurricane	A
257	North Weald	Hurricane	A
249	North Weald	Hurricane	A
46	Stapleford	Hurricane	A
264	Hornchurch	Defiant	Night-Flying
41	Hornchurch	Spitfire	A
603	Hornchurch	Spitfire	A
222	Rochford	Spitfire	A
141	Gravesend	Defiant	Night-Flying
74	Biggin Hill	Spitfire	A
92	Biggin Hill	Spitfire	A
66	West Malling	Spitfire	A
421 (½)	West Malling	Hurricane	Reconnaissance
605	Croydon	Hurricane	A
253	Kenley	Hurricane	A
501	Kenley	Hurricane	A
219	Redhill	Blenheim and Beaufighter	Night-Flying
145	Tangmere	Hurricane	A
213	Tangmere	Hurricane	Night-Flying
422 (½)	Tangmere	Hurricane	Night-Flying
602	West Hampnett	Spitfire	A
23	Ford	Blenheim	Night-Flying

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No. 12 Group.

Squadron.	*War Station.*	*Type of Aircraft.*	*Category.*
303 (Polish)	Leconfield	Hurricane	C
616	Kirton-in-Lindsey	Spitfire	C
85	Kirton-in-Lindsey	Hurricane	C
151	Digby	Hurricane	C
1	Wittering	Hurricane	C
266	Wittering	Spitfire	C
29 (½)	Wittering	Blenheim	Night-Flying
72	Coltishall	Spitfire	C
64	Coltishall	Spitfire	C
242	Duxford	Hurricane	A
310 (Czech)	Duxford	Hurricane	A
19	Duxford	Spitfire	A

No. 13 Group.

607	Turnhouse	Hurricane	C
645	Turnhouse	Spitfire	B
232 (½)	Drem	Hurricane	C
263 (½)	Drem	Hurricane	C
1 (Canadian)	Prestwick	Hurricane	C
32	Acklington	Hurricane	C
610	Acklington	Spitfire	C
600 (½)	Acklington	Blenheim	Night-Flying
43	Usworth	Hurricane	C
54	Catterick	Spitfire	C
600 (½)	Catterick	Blenheim	Night-Flying
245	Aldergrove	Hurricane	C

No. 14 Group.

3	Castletown	Hurricane	C
111 (½)	Dyce	Hurricane	C
111 (½)	Montrose	Hurricane	C

Non-Operational Squadrons.

Group.	*Squadron.*	*Station.*	*Type of Aircraft.*
9 Group	308 (Polish)	Baginton	Hurricane
12 Group	306 (Polish)	Church Fenton	Hurricane
	307 (Polish)	Kirton-in-Lindsey	Defiant
	71 (Eagle)	Church Fenton	Buffalo
13 Group	263 (½)	Drem	Whirlwind

Note.—Two "B" Squadrons, Nos. 74 and 145, had already been thrown into the battle, leaving only two available at the end.

(*Continued from page* 204)

is their respect we want. Our achievements speak for themselves and have won the admiration of the world; let us not lose it by trying to explain ourselves.

Blondel admits that he does not understand fully what we mean by democracy, but he says, quite rightly, that newspapers attempt to justify their existence with the plea that in a democracy it is essential for the man in the street to keep abreast of current affairs. He then issues this challenge: Turn up any newspaper which is six months old and you will find that most of the topics which occupy the headlines are today as dead as mutton.

And I'll be hanged if he isn't right!

So how should we be the worse off if we did not follow the news day by day?

On the question of printed forms I find him both instructive and amusing, not so much for what he says as for the way he says it. We of this century have evidently lost the art of picturesque vituperation! But I am not going to quote: if there is any man not moved to eloquence of his own on this subject he must indeed be a lily-livered loon.

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FALSE GODS

by W. G. Sheppard

(3) CAXTON, MARCONI

WHEN I started this series of articles the false gods I had in mind were the men whose pronouncements are regarded almost as divine ordinances, not to be questioned. To judge from my postbag, however, most of my readers interpret false gods to mean those whose contributions to knowledge or the arts are accepted unthinkingly as of godlike beneficence when in fact they have proved a curse. So let it be: the customer is always right, and it is not for me to complain.

The number and the intensity of the phobias brought to light amaze me. One of the most interesting is in a communication signed "Blondel, Hon. Sec., The Amalgamated Union of Court Jesters, Minstrels and Clerks." From the anachronistic title readers may be inclined to infer that the whole thing is a hoax; but there is sufficient internal evidence, I think, to prove that it is genuine. And the fact that it was obviously written with a planchette is at least suggestive.

Mr. Blondel couples Caxton and Marconi as the false gods most abhorrent to his union, on the grounds that, although Caxton did not invent printing, or Marconi wireless, it is their names which symbolize a pernicious publicity in its two most potent forms. He, like all good trade unionists, bases his case on considerations of what is good for the community; but he seems unable to conceal his own intense feeling in the matter. (And that, I think, is almost conclusive evidence against the document's being a forgery.) For example, one can almost hear him gnashing his teeth over a song called "Open the door, Richard," which, he informs me, was plugged by the B.B.C.

According to him, this is an inane plagiarism of one of his own most moving songs, "Open the door for Richard," with which he could be sure of a night's lodging, a square meal and unlimited liquor at any castle in Christendom where there were old Crusaders. Not only did the song last him the whole of his professional life but in the end he was able to dispose of the rights in it for four silver pennies.

There, perhaps, is revealed the root cause of his complaint printing and broadcasting have rendered him and his fellow-members superfluous. It is the jesters and the minstrels who are particularly bitter about broadcasting, and the clerks about printing. They naturally make much of the B.B.C.'s grimly ironic motto, "Nation shall speak peace unto nation," pointing out that it is used mainly for lying propaganda and the war of nerves. If I knew how to communicate direct with him I might point to the other side of the picture, how broadcasting has made possible the international dissemination of modern national music; but I fear that the answer might be: "Exactly!" and it is difficult to reply effectively to these single-word comments.

The general case against printing, however, is stronger than I should have thought, and is remarkably well presented. That, I suppose, is because clerks in the old days, besides being scribes, had many of the functions of the family lawyer. I give the argument in my own words, mainly because the original is too lengthy, but also because the writer, familiar as he obviously is with Fowler's "Modern English Usage," seems to find archaic constructions and forms of expression more natural.

Books, newspapers and magazines, and printed forms are considered separately.

As regards the first, of the books which are published 99.99 per cent. are at the best ephemeral, and 90 per cent. are bad books. But there are far too many books of all sorts, including the good ones. When shall we see again the like of the former poor Scottish student! His books were few because he could not afford more; but those he had he knew inside out, whereas his successor undermines his intellect with undigested ideas from an immense number of books. The widely read man has replaced the well-read man. Omnivorous reading is a drug habit which dulls both sense and senses, making of the mind a ragbag instead of a tempered instrument for *ad hoc* thought.

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(*Continued on page* 203)

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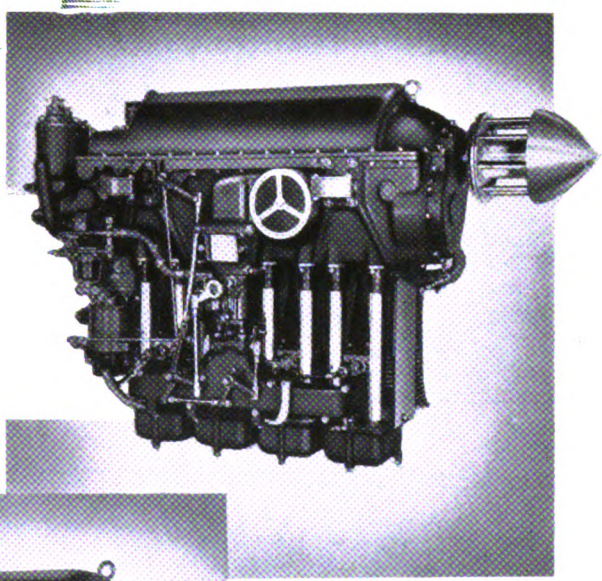

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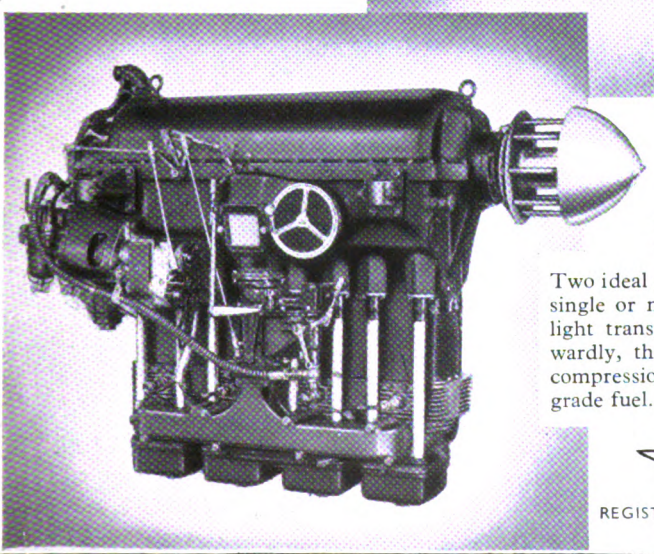

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FALSE GODS

by W. G. Sheppard

(3) CAXTON, MARCONI

WHEN I started this series of articles the false gods I had in mind were the men whose pronouncements are regarded almost as divine ordinances, not to be questioned. To judge from my postbag, however, most of my readers interpret false gods to mean those whose contributions to knowledge or the arts are accepted unthinkingly as of godlike beneficence when in fact they have proved a curse. So let it be: the customer is always right, and it is not for me to complain.

The number and the intensity of the phobias brought to light amaze me. One of the most interesting is in a communication signed "Blondel, Hon. Sec., The Amalgamated Union of Court Jesters, Minstrels and Clerks." From the anachronistic title readers may be inclined to infer that the whole thing is a hoax; but there is sufficient internal evidence, I think, to prove that it is genuine. And the fact that it was obviously written with a planchette is at least suggestive.

Mr. Blondel couples Caxton and Marconi as the false gods most abhorrent to his union, on the grounds that, although Caxton did not invent printing, or Marconi wireless, it is their names which symbolize a pernicious publicity in its two most potent forms. He, like all good trade unionists, bases his case on considerations of what is good for the community; but he seems unable to conceal his own intense feeling in the matter. (And that, I think, is almost conclusive evidence against the document's being a forgery.) For example, one can almost hear him gnashing his teeth over a song called "Open the door, Richard," which, he informs me, was plugged by the B.B.C.

According to him, this is an inane plagiarism of one of his own most moving songs, "Open the door for Richard," with which he could be sure of a night's lodging, a square meal and unlimited liquor at any castle in Christendom where there were old Crusaders. Not only did the song last him the whole of his professional life but in the end he was able to dispose of the rights in it for four silver pennies.

There, perhaps, is revealed the root cause of his complaint printing and broadcasting have rendered him and his fellow-members superfluous. It is the jesters and the minstrels who are particularly bitter about broadcasting, and the clerks about printing. They naturally make much of the B.B.C.'s grimly ironic motto, "Nation shall speak peace unto nation," pointing out that it is used mainly for lying propaganda and the war of nerves. If I knew how to communicate direct with him I might point to the other side of the picture, how broadcasting has made possible the international dissemination of modern national music; but I fear that the answer might be: "Exactly!" and it is difficult to reply effectively to these single-word comments.

The general case against printing, however, is stronger than I should have thought, and is remarkably well presented. That, I suppose, is because clerks in the old days, besides being scribes, had many of the functions of the family lawyer. I give the argument in my own words, mainly because the original is too lengthy, but also because the writer, familiar as he obviously is with Fowler's "Modern English Usage," seems to find archaic constructions and forms of expression more natural.

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As regards the first, of the books which are published 99.99 per cent. are at the best ephemeral, and 90 per cent. are bad books. But there are far too many books of all sorts, including the good ones. When shall we see again the like of the former poor Scottish student! His books were few because he could not afford more; but those he had he knew inside out, whereas his successor undermines his intellect with undigested ideas from an immense number of books. The widely read man has replaced the well-read man. Omnivorous reading is a drug habit which dulls both sense and senses, making of the mind a ragbag instead of a tempered instrument for *ad hoc* thought.

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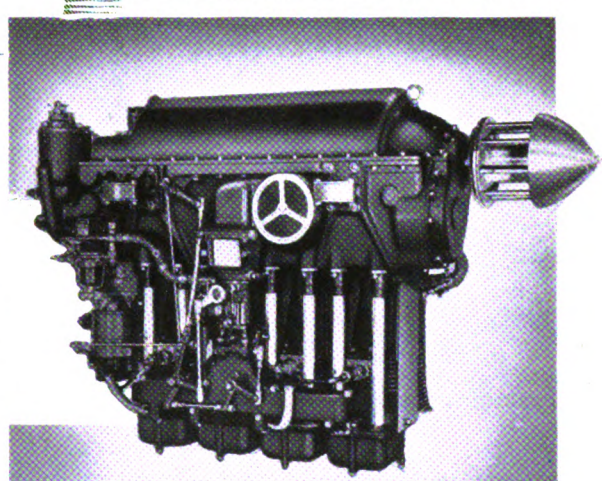

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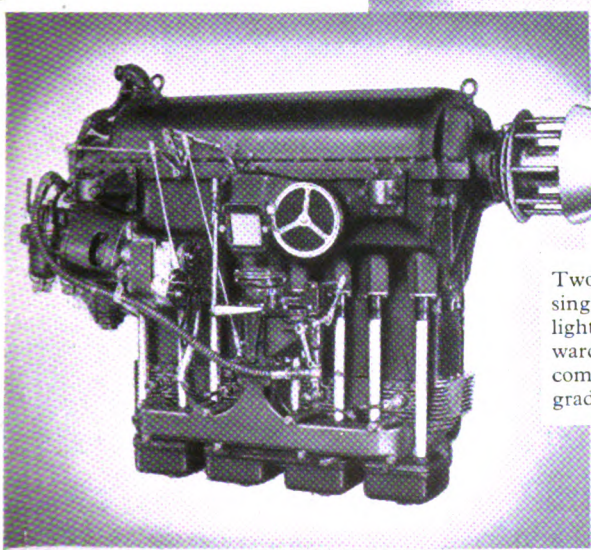

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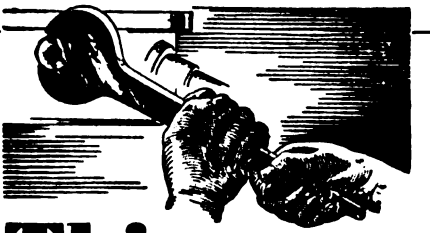

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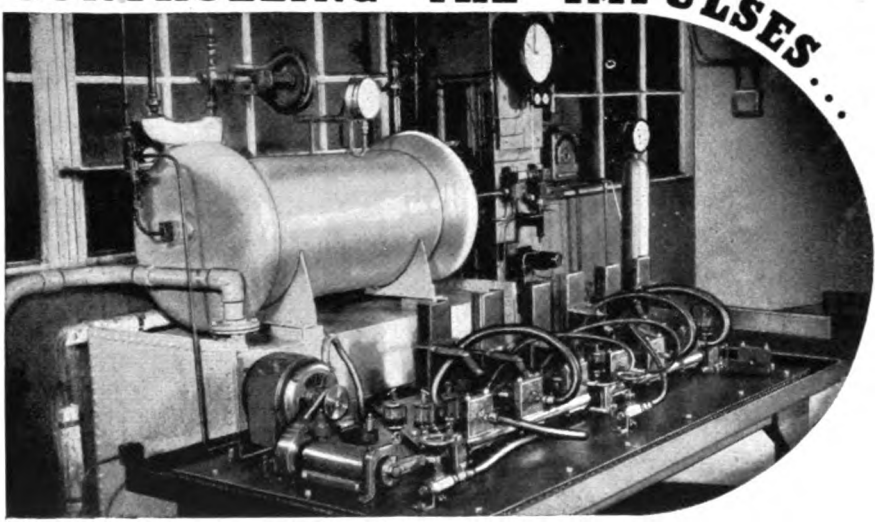

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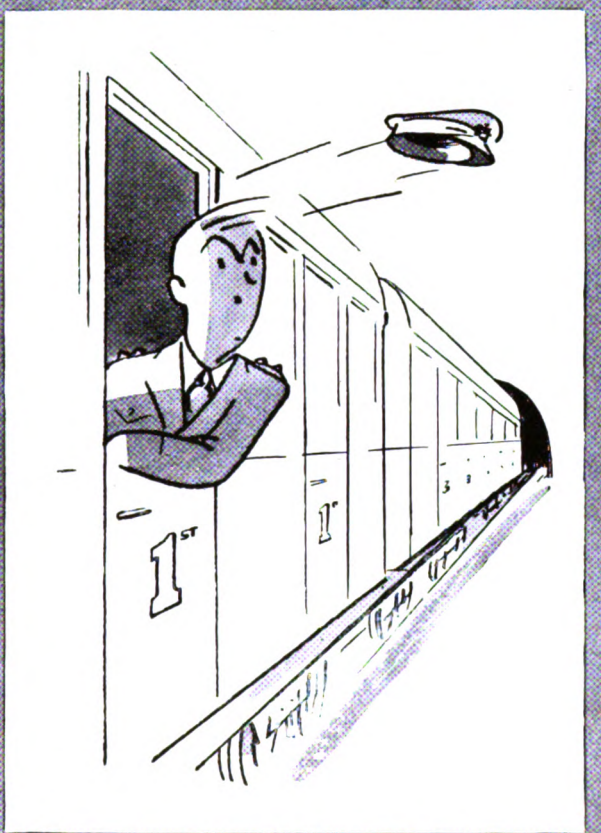

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THE CLOSING DATE FOR THE COMPETITION IS 31st October, 1947, after which no further entries will be considered. Results will be announced in this journal.

Entries should be sent to the Public Relations Officer, NAAFI., Ruxley Towers, Claygate, Esher, Surrey.

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RULES

1. The design must be capable of reproduction on paper, in wood or metal, or as a stencil.
2. Each entrant may submit up to three designs.
3. Competitors may prepare designs in pencil, crayon, ink or paint.
4. Entries will be judged on the following qualities —
   (*a*) Shape; (*b*) Colour; (*c*) the incorporation of the letters NAAFI; (*d*) Motif.
   As a guide, the Shape should be bold, recognisable at some distance, and likely to be easily remembered.
   Colour; there is no restriction in the use of colours but entrants will no doubt bear in mind the Navy blue, Army scarlet and Royal Air Force blue as suggesting a suitable colour basis.
   NAAFI; the letters NAAFI (without full points) should be incorporated into the design and be immediately readable.
   Motif; this should symbolise the NAAFI's service to the Royal Navy, Army and the Royal Air Force
5. Designs may be of any size, although 12 ins. by 12 ins. is suggested as convenient limit.
6. The Number, Rank, Name and *permanent* address of the competitor must be written on the back of each entry submitted.
7. The judges' decision will be final and no correspondence in connection with the competition will be entertained.
8. Proof of posting will not be accepted as proof of delivery.
9. NAAFI does not guarantee to adopt as its official badge the winning design, or any design, submitted in this competition.
10. NAAFI reserves the right to reproduce the designs of all prize winners. Unsuccessful designs will be returned to the entrants.

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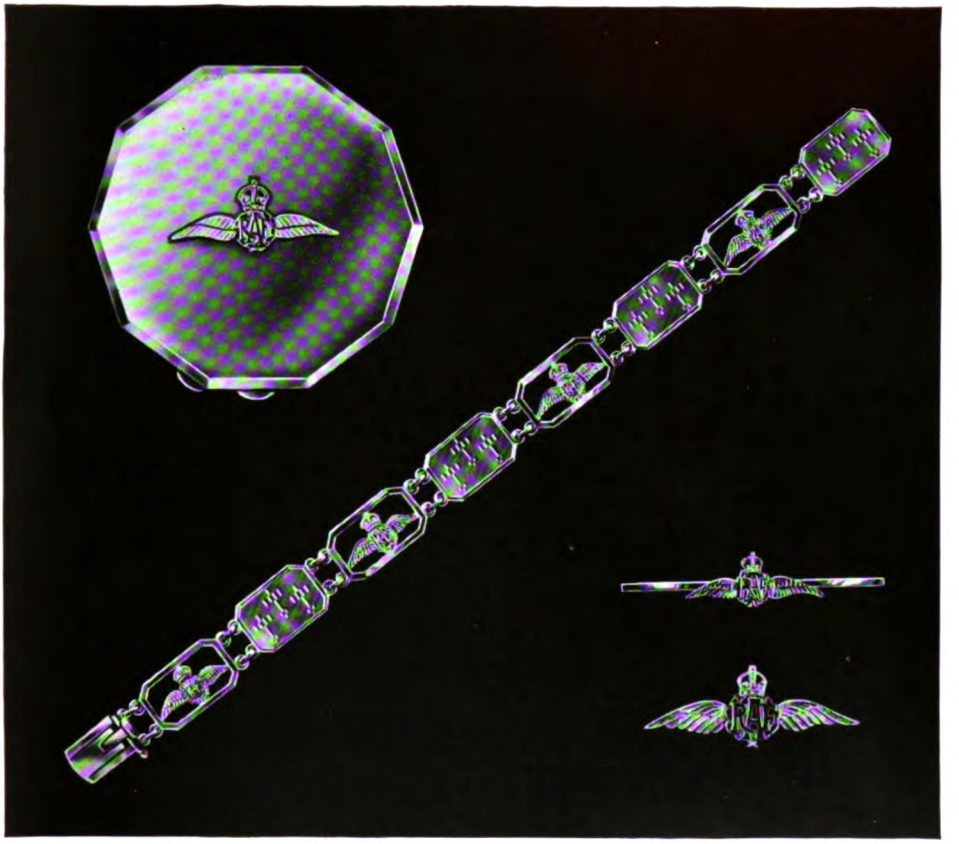

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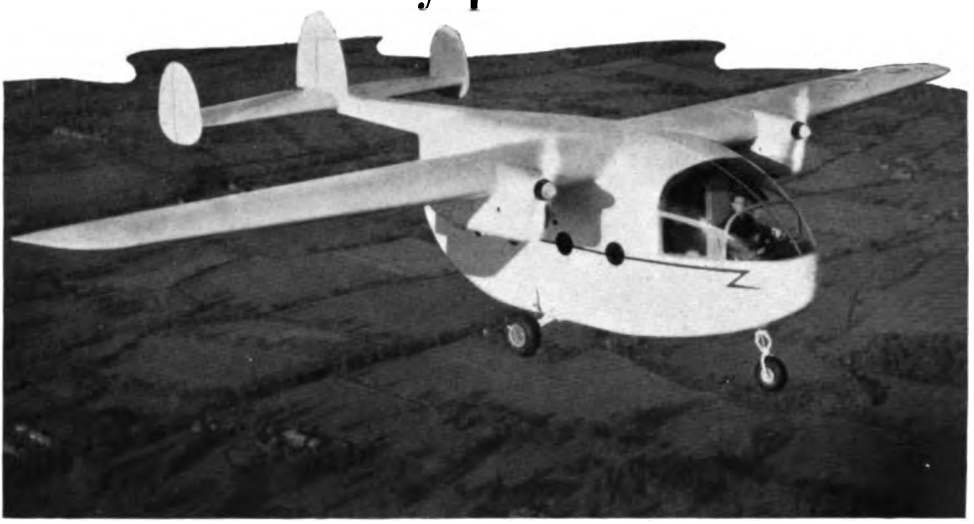

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EDITORIAL

Australian Defence and Services

NEW NAVAL AIR ARM

BY September, 1948, Australia will have acquired the first of the two aircraft carriers that are to be added to the R.A.N. Squadron. These modern fleet units will augment the defence power and fighting force of the Royal Australian Navy, which has already left its mark on the oceans of the globe, despite the fact that it was formed less than forty years ago.

The decision to set up an independent Navy arose with the creation of the Commonwealth of Australia, which came into being from an amalgamation of the separate colonies on 1st January, 1901. It was some time, however, before public opinion had strengthened to the stage at which a decision was made to build and maintain a naval squadron.

By the outbreak of war in 1939 the cruiser and destroyer strength was two 8-inch cruisers, *Australia* and *Canberra*, four 6-inch cruisers, *Sydney*, *Hobart*, *Perth* and *Adelaide*, and the destroyers *Stuart*, *Vampire*, *Vendetta*, *Voyager* and *Waterhen* which had been loaned by Britain in 1933. To these were added the Australian-built sloops *Yarra* and *Swan*.

Such was the expansion brought about by the war and by an intense shipbuilding effort that, at the conclusion of hostilities, the Australian naval strength stood at: three cruisers, nine destroyers (six loaned by Britain), three landing ships (infantry), one destroyer transport, one destroyer escort, two sloops, six frigates, fifty-three corvettes, three auxiliary anti-submarine vessels, five auxiliary minesweepers, ten auxiliary vessels (ammunition, victualling and store carriers), one fleet oiler, three repair ships, nine boom defence vessels, five tugs, two cable repair ships, seven surveying vessels, twenty-eight Fairmiles, twenty-six harbour defence motor launches and 140 miscellaneous small craft.

At the outbreak of war R.A.N. personnel totalled 5,440. By the end of the war this total was 37,200 mobilized personnel and 2,700 members of the Women's Royal Australian Naval Service.

Australian naval vessels lost during the Second World War were: three cruisers, four destroyers, two sloops, three corvettes, one auxiliary minesweeper, one depot ship, four store carriers, one small survey vessel and two Fairmiles.

Casualties, killed and wounded, totalled: officers, 277; ratings, 2,505.

A new outlined defence policy, published in June, 1947, indicated that the R.A.N. will receive a vote of £A15,000,000 totalling £A75,000,000 for five years. It was aimed in five years to have twenty-six ships, including two of the most modern aircraft carriers, in commission, and seventy-nine ships in reserve. Ships in commission would be: one squadron consisting of two light aircraft carriers, two cruisers and six destroyers; an escort force of three frigates, a survey force of three survey ships and their tenders; and a training unit consisting of one frigate, two Australian minesweeping vessels, and three air-sea rescue vessels.

The programme would require personnel totalling 10,450 in the year ending on 30th June, 1948, consisting of 4,040 seagoing personnel, and 6,410 for shore establishments and pools. In the final year of development the comparative figures would be 6,756 seagoing forces and 7,997 for shore establishments, a total of 14,753.

THE ROYAL AUSTRALIAN AIR FORCE

Behind the Royal Australian Air Force's plan to establish a college at Point Cook, Victoria, for the training of officers is the story of Point Cook's development from the Central Flying School set up there in February, 1914, when two officers, four mech-

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anics, one clerk and a caretaker represented the personnel of the aviation instructional staff of the Australian Flying Corps—the first separate Dominion air arm.

Two years earlier, H. A. Petre and the late E. Harrison (who was later to become the R.A.A.F.'s Director of Aeronautical Inspection) had been commissioned in the Australian Military Forces as the first two officers of the Australian Flying Corps. They arrived in 1913, with mechanics and two BE2A aircraft, two Deperdussins, and one Bristol aircraft. For a base the Defence Department bought 734 acres at Point Cook.

The first flying course began on 17th August, 1914. One of the students was Lieut. R. Williams (later to become the first Air Marshal of the R.A.A.F., and now Director-General of Civil Aviation).

Active service came early to the Australian Flying Corps. The first unit went to German New Guinea on 30th November, 1914, commanded by Lieutenant Harrison, with one BE2A and a Farman seaplane. The unit saw no action, and returned early in 1915, but it was the first flying unit of any Dominion to see oversea service.

In February, 1915, the Viceroy of India cabled asking whether Australia could provide any flying staff for service in the Tigris Valley. Australia sent the famous first half flight, under Capt. Petre, comprising four pilots, with mechanics, which sailed for Bombay and Basra on 20th April. India provided the aircraft. This half flight made history with Townshend's force. Lieut. Merz was killed, Capt. T. W. White captured near Baghdad, and nine mechanics were captured in Kut. The rest joined the A.F.C. in Egypt in 1916.

In September, 1915, Britain suggested that the Dominions might form flying units within the Royal Flying Corps. Australia agreed on 27th December, after much discussion, to organize one squadron. No. 1 Squadron, A.F.C., was the first complete squadron ever sent overseas from any Dominion to the war. It was formed at Point Cook and sailed in March, 1916, commanded by Lieut.-Colonel E. H. Reynolds. A second squadron (No. 3) left in October, 1916. No. 4 went overseas in January, 1917. No. 2 Squadron was formed in Egypt, personnel being selected from Australian troops there. It landed in England in January, 1917.

In June, 1916, No. 1 Squadron went into action at Suez and Kharga. Its most famous member was Lieut. F. H. McNamara (later Air Vice-Marshal, as A.O.C., Aden), who won a V.C. rescuing a comrade in the desert in Sinai in 1917. Among the commanding officers was Major R. Williams. The squadron shot down twenty-eight, and forced down fifty-three.

No. 2 Squadron was in France in September, 1917, No. 4 in December, 1917. Both were single-seat fighter squadrons. No. 2 began operations at Cambrai with offensive fighter patrols, but began circus patrols in March, 1918. No. 4 served in the Lille, Cambrai and Lys areas of France and Flanders. Both squadrons co-operated from July, 1918. No. 2 finished the war with a score of ninety-four destroyed and ninety-one forced down, while No. 4 destroyed 137 and forced down seventy-two.

Outstanding among the Australian aces of the 1914-18 period was Air Commodore (then Capt.) A. H. Cobby, D.S.O., D.F.C. and two bars, who shot down thirty-two aircraft.

No. 4 Squadron was the only Australian unit of any type (land or air) to take part in the occupation of Germany after the First World War. The present Chief of the Air Staff, Air Marshal G. Jones, was a pilot in that squadron.

All the squadrons returned to Australia during 1919 and were disbanded. Between 1914 and 1918, 158 pilots had been trained in Australia. After that there was practically no military flying activity until the Australian Air Corps was formed in 1920 to man the flying school at Point Cook. The Corps was part of the Australian Military Forces and the first chief was Lieut.-Colonel R. Williams. On 31st March, 1921, the A.A.C. was disbanded, and the Royal Australian Air Force created as a separate Service administered by the Air Board.

At first the R.A.A.F. comprised headquarters in Melbourne, No. 1 F.T.S. and No. 1 A.D. at Point Cook, and a London liaison office. No new units were formed for four years, but all the existing units were built up to establishment.

Two new squadrons were formed on 1st July, 1925 (No. 1 Squadron and No. 3

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Squadron) at Point Cook. No. 3 moved almost at once to Richmond, New South Wales, and its first commanding officer was F./Lieut. (later Air Commodore) F. Lukis. They were Citizen Air Force squadrons. Also formed was No. 101 Flight, for fleet co-operation, which went to Richmond; No. 1 A.D. went to Laverton, Victoria.

In 1928 Sir John Salmond toured Australia to report on air defence. His recommendations were not adopted because of cuts to the Services vote, but they formed the basis of the development which was going ahead when war broke out in 1939.

In peace time the R.A.A.F. existed to train personnel and establish an organization and administrative system which could expand into a big war-time force. At the same time it provided pilots and aircraft for emergency work, such as air rescue or supply for isolated areas, and was used largely in air photography, in fire patrol, and for survey work.

The organization of the R.A.A.F. followed the R.A.F. in all respects except the colour of its uniform. Customs are the same as in the R.A.F., and members of both Services can be exchanged wthout noticeable difference in general life.

In 1939 the R.A.A.F. was in the middle of its development scheme. The old Bristol Bulldogs and Hawker Demons had gone. The home-grown Wirraway was in production. Military aviation was regarded as vital to the defence of Australia. In September, 1939, Australia was forming an air force of nineteen home defence squadrons, a development to be completed by June, 1941.

A few days after war broke out the then Prime Minister, Mr. Menzies, told the country that the Government intended to send abroad an Air Expeditionary Force of six squadrons—a large force in 1939 terms. This plan was cancelled when, on 26th September, the British Government cabled to Ottawa, Wellington and Canberra proposals for the Empire Air Training Scheme. The Australian delegation left Sydney on 13th October, 1939. The leader, Mr. Fairbairn, was later sworn in as first Australian Minister for Air. One of his staff was Wing Commander George Jones, Assistant Chief of the Australian Air Staff at that time.

Australia agreed to put into training by March, 1943, 10,400 pilots and 15,600 W.A.Gs., to build numerous training schools, and to manufacture 233 Wirraways, Wacketts and Tiger Moths. To secure recruits the R.A.A.F. chose as Director of Recruiting Group Capt. A. H. Cobby.

The first I.T.S. courses in each of the Dominions under the E.A.T.S. opened on 29th April, 1940. The Australian I.T.S. was at Somers, Victoria, its commanding officer the A.F.C. pilot Wing Commander T. W. White. To start training at that early date was an achievement in itself, for it demanded a tremendous expansion, planning and construction. Australia agreed to give basic training to all her aircrew recruits, both in the E.A.T.S. and Home Defence schemes, and to provide personnel for a certain number of squadrons overseas.

The first squadron overseas was the Sunderland unit, No. 10 Permanent Squadron, whose personnel had arrived in Britain to take over the flying boats when war began. No. 10 stayed there and made no little history. It flew continuously until the end of the war.

The first squadron (also permanent) to go overseas was No. 3, which arrived in the Middle East on 23rd August, 1940. It served in Syria with the A.I.F., fought through the Western Desert campaigns, and was with the Eighth Army from Alamein to the Italian Alps.

First personnel sent overseas direct to active service were for Nos. 450 and 451 Squadrons, who left Australia in April, 1941. Like No. 3 and often with it, they served in the Levant and Middle East, and with the Eighth Army.

Other E.A.T.S. squadrons were raised in Britain. No. 454 Baltimores and No. 459 Hudsons were two of them. First in action was No. 452 Spitfires. With Finucane (R.A.F.), "Bluey" Truscott, Bungey, Wawn and other aces, No. 452 was one of the most famous of all the fighter squadrons in Britain. At times it led the Fighter Command score.

By the end of July, 1943, there were fifteen E.A.T.S. R.A.A.F. squadrons operating in overseas theatres of war. About half of them were in the United Kingdom. No. 460,

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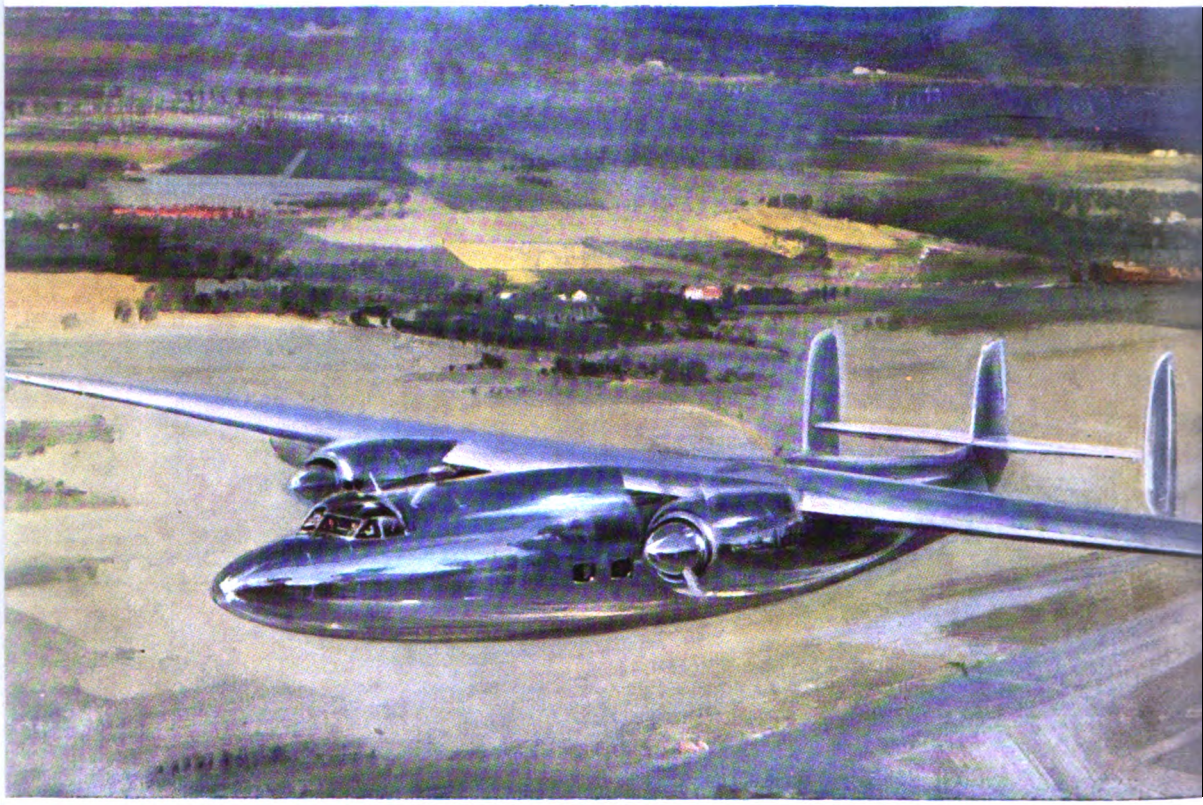

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the first R.A.A.F. Lancaster squadron, had hit Germany for two years and had participated in most of the great raids.

Australians in Britain took part in every major air operation from the first 1,000-bomber raid on Cologne to the close of hostilities. Apart from the R.A.A.F. Lancaster, Mosquito, Spitfire and Beaufighter squadrons, thousands of R.A.A.F. aircrew men served in R.A.F. squadrons. Some of these R.A.A.F.-R.A.F. men were in the breaching of the Mohne and Eder Dams in 1943.

In the Middle East, Australians were also flying in R.A.F. and R.A.A.F. squadrons. One officer—Group Capt. Brian Eaton, D.S.O., D.F.C., formerly of No. 3 Squadron, R.A.F.—commanded an R.A.F. wing in the landing in South France in August, 1944. Some R.A.A.F. squadrons fought through from Alamein into Italy, while others, such as the naval co-operation squadron, were based at various points in Africa.

In the Pacific the R.A.A.F. was co-operating with the U.S.A.A.F. in helping to smash back the Japanese after No. 75 Kittyhawk Squadron had held New Guinea practically single-handed. Throughout the Pacific from bases ranging from Northern Australia to Burma, Australians in R.A.A.F., R.A.F., U.S.A.A.F. and Dutch squadrons helped in many of the major phases of the war against Japan.

The R.A.A.F.'s phenomenal expansion under the Empire Air Training Scheme permitted Australia to concentrate powerful forces on many fronts. At its peak (reached on 19th December, 1944) the Service had a strength of 182,920, including 18,462 in the Women's Australian Auxiliary Air Force.

R.A.A.F. TO ESTABLISH AIR CADET COLLEGE

The Royal Australian Air Force is about to establish a Cadet College at Point Cook, Victoria, for the training as officers of boys between the ages of 16 and 18 years. The College will begin annual courses early in 1948.

Point Cook was the first air training establishment in Australia, being opened in 1921 when the R.A.A.F. was formed to replace the Australian Flying Corps, first Dominion Air Force.

Courses at the College will be of four years' duration. The first two years will cover mainly academic studies and some Service instruction. Flying training will be concentrated in the last two years of the course, when training will be devoted wholly to Service studies, concluding with specialization towards the branch in which the air cadets would eventually graduate.

The annual intake of cadets will be approximately twenty-four pupils.

R.A.A.F. APPRENTICESHIP PLAN

The Royal Australian Air Force apprenticeship training scheme to be instituted for the training of technical musterings will probably be begun early in 1948. The scheme provides for the enlistment of boys of 15 to 16 years for three-year technical courses of training as skilled tradesmen. They will ultimately become eligible for senior higher trade mustering N.C.Os. in the Permanent R.A.A.F.

On completion of apprenticeship, airmen graduates will be required to serve a period of twelve years in the Permanent Air Force. Subsequent re-engagement will be for six-yearly periods.

R.A.A.F.'s ROLE IN ANTARCTIC EXPEDITION

In the coming Australian Antarctic Expedition the R.A.A.F. will provide one Walrus and one Kingfisher aircraft, with aircrew and maintenance staff. The Walrus, equipped for vertical and oblique photography, will be carried on board an L.S.T. and will be accompanied by a pilot, a photographer, a radio operator and two fitters. The Kingfisher, equipped for oblique photography, will operate from the expedition ship, the *Wyatt Earp*, and will have a maintenance expert as well as a pilot.

Radio and radar equipment will be provided.

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No. 24 Transport Squadron, R.A.F., to be a Commonwealth Squadron

THE Air Ministry announces that authority has been given for the reorganization of No. 24 Squadron, Transport Command, R.A.F., to include representation from the R.A.A.F., R.N.Z.A.F. and S.A.A.F., and for the Squadron to be renamed No. 24 (Commonwealth) Squadron.

The object of the reorganization is threefold: to extend the close co-operation existing between the R.A.F. and the Dominion Air Forces; to foster the development of a common technique in air transport matters; and to provide experience of flying conditions and routes in all parts of the world, thus maintaining a nucleus of highly trained personnel in the R.A.F. and in each of the Dominion Air Forces represented in the Squadron. In order that aircrews are conversant with the routes over which they may be required to fly, training flights to the various Dominions are to be part of the Squadron's training programme.

The establishment of the Squadron is to be twenty-eight crews, five of which will be provided by the R.A.A.F. and three by the S.A.A.F. on an exchange basis between the R.A.F. and these two Dominion Air Forces, and two by the R.N.Z.A.F. The period of service of Dominion aircrews with the Squadron will be not less than a year and a half and not more than two and a half years' duration. The post of Squadron Commander is to be filled by each of the Dominions and the R.A.F. in turn.

The Squadron is to be located at R.A.F. Station, Bassingbourn, and is to be under the operational and administrative control of Headquarters, No. 46 Group, Transport Command. It will be employed primarily on special flights and the carriage of Service V.I.Ps. who cannot conveniently be carried by civil aircraft.

American Sculptor's Gift to Royal Air Force

(*See frontispiece*)

THE Air Council has accepted, for presentation to the R.A.F. College, Cranwell, the gift of a bronze bust of a British airman, the work of the donor, Miss Eleanor Mellon, a distinguished American sculptor living in New York.

Miss Mellon met many members of the Royal Air Force while they were training in America during the war and she frequently helped to entertain them at the Air Force Club in New York. Her admiration for them found expression in her art, and several Americans who saw this head when it was originally done in terracotta suggested that it should be done in bronze and offered to the Royal Air Force as a gesture of American friendship.

The bronze was brought to England by Miss Gretchen Green, who was recently awarded the M.B.E. for her outstanding work in America during the recent war in organizing hospitality and welfare of every kind for British men of all the three fighting Services, and it was presented to the Commandant of the R.A.F. College, Cranwell, on 25th July by Mrs. Lewis Douglas, wife of the American Ambassador, a personal friend of Miss Mellon.

More Auxiliary Air Force Regiment Squadrons

Eight more light anti-aircraft squadrons of the Auxiliary Air Force Regiment are to be formed this year, and another eight in March, 1948, in addition to the four already established in Middlesex, Edinburgh, Gloucester and the West Riding.

First of the new units to start recruiting is No. 2611 (West Lancashire) Squadron, which began to form at Woodvale airfield, near Liverpool, on 1st October. The other seven new squadrons will be formed on 1st December: No. 2502 (Ulster) at R.A.F. Aldergrove; No. 2504 (County of Nottingham) at R.A.F. Hucknall; No. 2602 (City of Glasgow) at R.A.F. Bishopbriggs; No. 2605 (County of Warwick) at R.A.F. Honiley; No. 2608 (North Riding) at R.A.F. Thornaby, Middlesbrough; No. 2612 (County of Aberdeen) at R.A.F. Dyce; and No. 2616 (South Yorkshire) at R.A.F. Doncaster.

When recruiting starts, the chief need will be fore ex-R.A.F. Regiment members, but others will be needed for spare-time service in a variety of trades.

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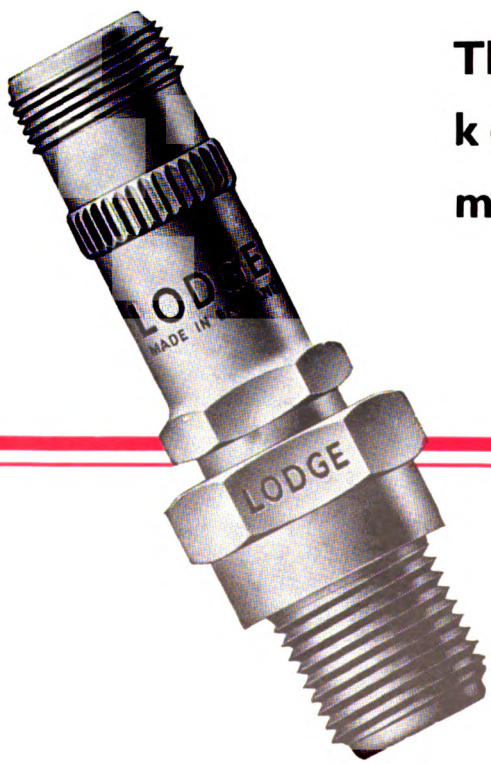

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EMPIRE AIR FORCES JOURNAL

EDITOR:

WING COMMANDER C. G. BURGE, O.B.E., q.s., R.A.F. (Retd.)

Assisted by an Advisory Committee of Members of the R.A.F. and Air Forces of the Dominions

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R.A.F. Quarterly Prize Essay, 1946-47

Subject: "Discuss Air Support in terms of Air Superiority and the influence of the one upon the other."

By WING COMMANDER J. H. LAPSLEY, O.B.E., D.F.C.

"It is necessary to win the air battle before embarking on the land battle. If this is not done, then operations on land will be conducted at a great disadvantage.

"It is not possible to conduct successful offensive operations on land against an enemy with a superior Air Force, other things being equal. The enemy's Air Force must be subdued before the land offensive is launched."

In these words Field-Marshal Montgomery has summed up the impact of Air Power on land battles. His words as an Army Officer are confined to the land battle but apply equally to the war at sea.

The Pattern of Modern Warfare

The air battle must first be won; the Air Forces must subdue those of the enemy. This is the battle for air superiority. There are no frontiers to this battle, it is waged wherever aircraft, operating from their furthest shore bases and from ships at sea, may meet: over mountains and plains; over coastal waters and the ocean deeps; over defence lines and minefields; but most critically, it is fought over the vital industrial areas of the opponents. The air support which can be given to land and sea forces is in direct proportion to the measure of air superiority, the freedom of action, which is won or lost in this battle.

The areas within which the opponents initially establish air superiority will depend chiefly on the numbers of single-seater fighters which are available to each, the effective range and relative performances of these aircraft and the number and position of the bases available from which they can operate. A fighter force operating over its own territory has many advantages. It suffers from no loss in flying time in reaching objectives or patrol areas, which increases the effective use that can be made of its aircraft; its fighter control systems can be employed more effectively and the pilots have a feeling of security encouraging high morale. On this account, even should there be a considerable difference in strength, it is probable that on the outbreak of a war each side will have air superiority over its base areas with a disputed area between.

Before a surface offensive can be made by either side its Air Forces must then endeavour to extend their areas of air superiority into the territory of their opponents. If the aircraft performances and pilot training on each side are approximately equal, this can only be done by putting a greater number of fighters than the enemy into the disputed air space, and continuing to do so. To do this successfully the relative strength of the enemy's air force must be reduced by attacking it with every means available. The whole effort of the strategic bomber force must therefore be directed against those industrial targets and transport systems which are vital to the enemy's aircraft industry, while the tactical bomber and fighter forces attack the enemy's aircraft on the ground and in the air.

The importance of the role of the strategic bomber force in the vital battle for air superiority cannot be sufficiently stressed, and true air superiority can only be won if the bomber force is directed during this phase wholeheartedly and consistently at targets affecting the enemy's air war potential. Heavy bombing attacks, when pressed home, apart from the direct damage caused by them, soon throw the enemy on to the defensive, making it necessary for him to divert more and more of his dwindling industry and his manpower to the production of fighter aircraft and other defensive measures. As his power to strike back is progressively dissipated, the relative strengths of the air forces change with increasing speed.

If this assault on the enemy's air force is effective and the strength of his air forces successfully depleted, his forward air bases become increasingly vulnerable to the point where they become untenable. The added disadvantage of operating at longer range is then forced upon him and an increased degree of air superiority is thus gained in the air over the enemy's forward area. This makes it possible for the ground forces to build up adequate supplies free from interference by the enemy air forces, while the enemy is prevented from so doing, and then to attack with full air support. Given these circumstances the enemy will be fighting under such a severe handicap that the attack is certain to succeed and will make available advanced air bases from which air superiority can be extended further into the enemy's territory towards his vital industrial heart. This is the basic plan for the application of air power.

Application in Europe

That this broad strategic air plan dominates both the war on land and at sea, has been conclusively proven during the 1939-45 war. In the European theatre the enemy, initially, by greater

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Application in Europe

That this broad strategic air plan dominates both the war on land and at sea, has been conclusively proven during the 1939-45 war. In the European theatre the enemy, initially, by greater

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strength of fighter aircraft established a marked air superiority over the battle area. As a result, his Stukas, practically unopposed, blasted all opposition from the path of his panzer divisions into France, and the Luftwaffe was able to establish forward air bases on the whole length of the Channel coast.

It then became necessary for the enemy to extend and maintain his area of air superiority to cover the Channel and the southern shores of England in order that his surface forces could make the difficult step across the water in the face of the opposition of the Royal Navy. Owing to our much greater naval strength, this meant that his fighter aircraft had to gain such a degree of air superiority that his supporting bombers and torpedo aircraft could operate in such force and with so low a wastage that they could prevent and continue to prevent the Royal Navy from effectively opposing his initial assault or subsequently severing his lines of communication.

The enemy's attempt to extend his area of air superiority to cover the Channel and the South of England is known as the Battle of Britain, and much has been written of this epic struggle. Fortunately, the high state of efficiency of the fighter defences stood the strain, and, generally against great odds, air superiority was maintained by the fighter squadrons over our vital industrial areas. As a result, the output of aircraft in which fighters had first priority continued to increase, and such a severe casualty rate was inflicted on the raiders that the enemy was forced to abandon using his bomber aircraft in daylight.

In the forward areas the enemy, despite savage bombing attacks, failed to make the fighter airfields untenable, and from them the squadrons fought desperately for, and maintained a considerable and increasing degree of air superiority over their bases and the waters of the Channel. Despite Bomber Command's smashing attacks on the enemy's concentrations of invasion barges, this maintenance of air superiority was indeed the R.A.F.'s greatest contribution in preventing a German invasion, for while the enemy's air forces were denied complete freedom of action, they could not have prevented the overwhelming surface strength of the Royal Navy from shattering any attempt at seaborne invasion.

Fortunately, it became apparent at that stage that the enemy had misappreciated the importance of a strategic bomber force in the battle for air superiority. As a result, their crews had been trained and the enemy's aircraft designed primarily to operate in daylight in a tactical support role rather than as a true strategic bomber force. Forced to abandon daylight attacks, their bomber squadrons had neither the technique nor the skill in night operations to make their attacks tell on our vital industries and destroy our means of production.

As the strength of Fighter Command grew and the United Kingdom base became increasingly secure, the strategic bomber force was steadily built up. Its role had been correctly appreciated and had been, in fact, the major factor in the decision to establish the Royal Air Force as an independent service. Moreover, the fact that it would not be able to strike far into the enemy's territory by day had been foreseen, and the emphasis had been on development and training in night bombing technique. Building on these firm foundations, the strategic bomber force was, by 1942, inflicting telling blows on the enemy's industry, and gradually the German High Command were forced another step towards their downfall by having to allocate additional men and aircraft to their defences.

This gradual process was accelerated with great impetus as the 8th U.S.A.A.F. arrived and commenced operations from their bases in England. This fine strategic bomber force worked to the same overall plan as the bombers of the R.A.F. Attacking by day, the Americans at first suffered severe casualties when they penetrated deeply into the German area of air superiority. Determined, however, to continue their daylight bombing policy, the vast resources of the American aircraft industry, working without danger of interruption by the enemy, poured out long-range fighters in addition to ever-increasing numbers of powerfully-armed four-engined bombers. By the skilful employment of these well-armed bombers, supported when occasions demanded by large numbers of these long-range fighters, the Americans were able to maintain a sufficient degree of air superiority along the route of the bomber force for it to be able to complete its task without excessive casualties.

The combination of the American attacks with those of the R.A.F. rapidly forced the Germans to devote practically their entire aircraft industry to defensive fighter aircraft. These aircraft had, moreover, to be concentrated further and further back in the areas of the vital targets. Thus, our area of air superiority was steadily extended over the Continent. Under cover of this mastery in the air, our surface forces were able to assemble in a vast armada, cross the Channel without any major air interference, and assault the enemy with the advantage of the support of every device of air attack.

Once the difficult step across the Channel was done, the fighters of the tactical air forces, working with the armies, consistently won complete air superiority to the limit of their range. The

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ground forces, free from enemy air interference both in the front line and on their lines of communication, and helped by strong direct air support, were able to advance steadily into and finally overrun the enemy's territory.

Application in the Pacific

The necessity for the same overall plan in a predominantly naval campaign emerges from an examination of the war in the Pacific.

The Japanese, by a surprise attack, gained complete air superiority over the American base at Pearl Harbour, and their strike aircraft, unopposed, delivered a crippling blow at the American Pacific fleet. The Allied front line in this campaign was the units of the British and American fleets, and from lack of aircraft carriers and shore bases, air superiority could not be held over these vital units.

The Pearl Harbour disaster to the American fleet on 7th December, 1941, was followed three days later by the sinking of H.M. ships, *Prince of Wales* and *Repulse*, again by Japanese aircraft operating unopposed. The major units of the Allied navies in the theatre were thus eliminated, and, moreover, it had become obvious that a similar fate would befall any naval reinforcements which could be sent until adequate air protection could be provided. The enemy surface forces, thereafter, under cover of their air superiority, moved practically unopposed. By May, 1942, they had established a spreading vine of conquest extending more than half way across the Pacific, southward to Australia and westward to the mountain barriers of the India-Burma front.

Its growth was checked only when air reinforcements, both sea- and land-based, had established firm areas of air superiority. The first instance was on 4th May, 1942, when, in the Coral Sea, the enemy's air forces failed to retain air superiority over a convoy heading for Australia. Allied land- and ship-based aircraft, maintaining air superiority over their own airfields and ships, won sufficient control of the air over the enemy convoy for strike aircraft to inflict crippling damage and force the enemy to retire. A month later, on 4th June, a similar action off Midway Island checked the Japanese advance towards America. As a result of these timely checks, the Japanese failed to attain bases from which the vast American industrial areas could be subjected to interruption by air attack. The final outcome of the war was from that time inevitable.

The Allies realized that any attempt to recapture their lost territories step by step would take years and would demand an appalling price in casualties. The correct understanding of the application of air power, however, pointed to the far quicker and less costly method of destroying the Japanese war industries by air bombardment; with these industries destroyed, the power of her armed forces must die. Brave efforts to bomb Japan were already being made by American air forces in China, and the Japanese Islands first came under bombardment of China-based B.29's on 15th June, 1944. The difficulties of supply unfortunately precluded this effort being built up to sufficient proportions. In the Pacific area, however, it could be done, but to bring the Japanese homeland under bombardment necessitated, firstly, the establishment of bases, within range, with a firm and safe line of communication.

Air power was therefore used firstly in conjunction with the Navies. Powerful carrier-based fighter and support airfleets were assembled from the ever-increasing output of the American war industry. Under cover of the air superiority won by these air forces, and armed with the devastating long-range attack of their bombs, the Allied Navies rapidly regained command of the Pacific sea lanes.

With the sea power won by these air forces in their grasp, the Allies could strike where the enemy was weakest, and step by step they advanced in a series of amphibious operations, capturing bases ever closer to the Japanese homeland. Similar to the preparation of Western Europe for invasion, each advance was preceded by air attack. The Japanese aerial threat to the Allied operations was steadily rolled back before Allied air superiority and direct support was provided on a vast scale for each assault. By the capture of these strategic bases, immensely strong Japanese garrisons were cut off and contained in pockets from which, because of the difficulty of the terrain and the Allied air and sea superiority, they could never break out, and were left, unattacked, their communications cut, to die on the vine.

The advance continued remorselessly. In June and July, 1944, Saipan and Guam Islands, in the Marianas, were attacked, and even before the Islands were cleared of enemy resistance, airfields were under construction from which the strategic bombers could commence the all-important reduction of the Japanese industries. The first major strike, the result of repeated assaults across the vast Pacific, was delivered on 24th November, 1944.

In October, 1944, an assault was made on the Island of Leyte, under cover of a formidable carrier task force. Here the Japanese decided to commit their fleet to a major battle in an endeavour to prevent the Americans from recapturing the Philippines. The resulting naval-air action continued for six days, during which the

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Allied air units continually fought for and maintained air superiority in the battle area. Almost all the serviceable elements of the Japanese Navy were committed to the battle with disastrous results; her fleet suffered a crippling blow at the hands of the Allied air and naval forces, and Japan was virtually eliminated as a sea power. Iwogima, only 775 miles from the Japanese islands, fell in March and brought the main Japanese islands within range of single-seater fighter aircraft. Okinawa followed in June after one of the fiercest battles for air superiority in history. At the cost of upwards of 1,000 aircraft, the Allies, in a two-months battle, daily fought for and held air superiority without which it would have been impossible for the Navies to maintain the troops assaulting the islands.

With Okinawa, Iwogima and the Marianas in Allied hands, the Japanese navy eliminated, and vast Allied carrier-based air forces operating from close into the Japanese coast, overwhelming air superiority was achieved over the enemy's vital industrial areas, and, had it been necessary, the Allied surface forces could have assaulted the Japanese homeland with a certainty of victory. However, the atom bomb, the terrible culmination of research into strategic bombardment, made the last assault unnecessary, and, with her war potential already virtually destroyed, Japan surrendered unconditionally under the threat of this final and terrible devastation from the air.

The Threads of the Pattern

From these two examples of the correct use of air power it is clear that the first essential in a war is to win air superiority and, having won it, to maintain it. To do this entails constant fighting for it by unrelentingly attacking the enemy air force in the air and on the ground and by disrupting the enemy's aircraft industry by strategic bombing. Only when air superiority has been gained, can a surface attack be armed with the spearhead of air support, and have a probability of success.

The shield of air superiority and the weapon of direct air support which is born from it are essential in both land and sea warfare; moreover, the battle for air superiority over land and over sea is a single battle and must be fought as such. The control of the nation's air resources must therefore be centralized under an independent air command having an equal status to those of the sea and land forces. The primary task of the air command is the winning and maintenance of general air superiority. It is essential that this aim is rigidly adhered to, and until air superiority is won, to resolutely concentrate the whole strength of the nation's air resources to this end.

The many different tasks which aircraft are called on to perform tend to produce many different types, which creates the danger that the output of the aircraft industry may be dissipated on non-essentials. The country's aircraft industry must therefore be given strict priorities from a central source, to direct its output. The security of the main bases, together with their industrial areas and sea communications, is of the first importance. Fighter aircraft to prevent disruption by enemy air attack in these areas must be given the first priority until air superiority over them is assured. Secondly, an air offensive against the enemy's industry must be built up to throw him on to the defensive and lower his air striking power. The most suitable bombers for this task must therefore be given the next priority, until the largest force which can be efficiently manned and operated is obtained. Thirdly, suitable aircraft for training the aircrews must be supplied. It should be clearly understood that these are the only types of aircraft which are essential to the winning of the all-important air battle, and the output of the less important support and miscellaneous aircraft must be strictly controlled to allow for these priorities.

The first broad air support requirement in purely naval operations at sea is reasonable immunity from air attack. Without this prerequisite the heaviest units of a fleet can be so crippled by even a small-scale air attack that they may be brought to battle with the opposing fleet at an overwhelming disadvantage. To insure against such a contingency the fleet and merchant convoys must be equipped with the best possible fighters which can be adapted to operate from carriers at sea. Secondly, naval operations require long-range reconnaissance and anti-submarine patrols which, being of a routine nature, are preferably carried out by land-based aircraft. Finally, for local fleet reconnaissance and attacking enemy ships, there is a requirement for a medium-ranged fighter-bomber type capable of carrying torpedoes or rocket projectiles.

A tactical air force supporting a land operation must be organized on a mobile basis so that it can continuously operate with the ground forces. Its role is both to implement the overall strategic air plan and to plan and conduct operations with the associated ground forces. The first requirement of a tactical air force, therefore, is that it should be capable of maintaining local air superiority in its area of responsibility, thus keeping the ground forces and its own bases free from serious enemy air interference. Providing the tactical air force can gain and maintain air superiority it can then undertake the task of direct sup-

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port. The Army's needs in this sphere require that it should be capable of providing them with information of the enemy, by both visual and photographic reconnaissance; reducing the enemy's military potential in the area affecting them by attacking his supply lines and reinforcement area; assisting their units by direct attack on the enemy in the battle area; planning and conducting the air aspect of airborne operations and undertaking for them such miscellaneous tasks as air supply and casualty evacuation.

The aircraft required by such a force, therefore, are, firstly, fighters for gaining air superiority. Experience in the past has shown, moreover, that the characteristics of high performance and manœuvrability inherent in the fighter make it the most suitable type of adaptation for reconnaissance and direct support duties. Whether it will be possible to use the fighter aircraft of the future as fighter-bombers for close support is a matter of conjecture. Even in the recent war the fighter-bomber was tending to differ in type from the straight fighter, and there has been much discussion on the need for a "rugged" aircraft for this role. In making plans for the future equipment of tactical air forces, however, the overriding importance of air superiority must on no account be overlooked and the aircraft specified for close support work with the Army must be the best possible fighter aircraft which can be modified to carry the extra armaments of bombs or rocket projectiles so that it can be usefully employed as a pure fighter to assist if necessary in the primary task of maintaining air superiority.

The accuracy and flexibility of the fighter-bomber make it the ideal aircraft for striking at small pin-point targets of opportunity such as enemy strong points, tanks, and transport convoys, but its small bomb load makes it uneconomical in use against bigger targets like marshalling areas, railheads, and gun areas supporting the enemy's forces. There is a requirement in a tactical air force, therefore, for a force of fast, strongly-armed medium bombers to deal with targets of this nature in the process of reducing the enemy's military potential in the area immediately affecting the ground forces. Finally, a troop-transport type, capable of acting as a glider tug, is needed for airborne operations, supply dropping and communications.

The Basis of the Pattern

This short study of the fundamental air requirements in warfare at sea and on land shows plainly the true relationship between air superiority and air support. In every instance air superiority is a primary and basic necessity. Initially, it must be won and held over the great industrial areas of the main bases so that the weapons for war can be produced without interference. It cannot be securely held by defensive measures alone; the strain on the air defences must be eased by striking at the sources of supply of the enemy's air power. Unless air superiority is firmly held over the main base the means of producing the weapons for resistance will be destroyed and the war must eventually be lost.

When the main base is made secure from air attack the essential supplies for an offensive can be built up. Firstly, the air striking power must be developed and directed at targets affecting the enemy's air potential, throwing him on to the defensive and lessening his power to strike back at our production or to dispute the spread of our air superiority. Consequently, under the cover of an ever-extending freedom of action in the air, firmly based on the increasing difference between the output of an aircraft industry immune from air attack and the enemy's dwindling aircraft production, supporting aircraft can greatly reduce the enemy's military potential in the area chosen for the assault. Surface forces attacking with full air support, their communications and supplies safe from enemy air interference, have then so great an advantage that ultimate success is certain. The basis of the pattern of modern war is the battle for air superiority; it is fought over every front, over every base. If it is won, final victory is certain and will be speeded by the deadly striking power of aircraft in support of the surface forces.

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ESSAY COMPETITIONS 1947/8

1. SUBJECTS:
   (i) Discuss the following statement: "If war cannot be abolished, the direction of our national resources and inventive genius to the needs of military air power would give us the greatest chance of victory."
   (ii) To what extent is it considered that the three Fighting Services *could* be amalgamated to achieve economy and to maintain, and possibly increase, their fighting efficiency?

2. THE COMPETITIONS are open to Members of ALL THE AIR (NAVAL, ARMY AND AIR) FORCES OF THE BRITISH COMMONWEALTH AND EMPIRE.

3. CLOSING DATE FOR COMPETITION: 31ST MAY, 1948.

4. Essays are not to exceed 10,000 words.

5. PRIZES offered for each subject are:

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AND FOR THE BEST ESSAY OVER ALL: £20

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The adjudicating committee will consist of two Air officers, one Naval officer and one Army officer.

RULES FOR SUBMITTING ESSAYS

Essays must be sent by *registered post*. No name or other indication of who the author of the essay is must appear on the essays, which should be placed in a sealed envelope marked "R.A.F. QUARTERLY Prize Essay Competition" and inserted in another envelope addressed to THE EDITOR, R.A.F. QUARTERLY, c/o D.S.T., Air Ministry, Whitehall, London, S.W.1.

The name and address of the competitor is to be inserted in a small sealed envelope attached to the inner envelope containing the two copies of the essay. These envelopes containing competitors' names will not be opened until the essays have been adjudicated.

Essays should be typed, but if this presents any difficulty they can be submitted in handscript providing this is legible.

A competitor may enter an essay in each subject.

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SPARES

(Contributed to the Series "Lessons I Have learned from the War")

By SQUADRON LEADER H. R. P. PATTERSON, O.B.E.

(This article has been awarded a Prize of eight guineas.—Ed.)

LOOKING back to the First World War it occurs to me that my most forceful lesson was never to put a head casualty feet first in a Ford ambulance. The combined effects of this disposition and the tight turns executed by the driver nearly drained the life out of me. I don't quote this as a case for general study; obviously someone blundered.

In the Second World War I had more to do with organization than execution, and there was one matter over which we struggled, swore, sweated and strove that seems to have received little publicity since the war, considering how nearly it brought us to destruction in the early years. This was spares for repair—repair of aeroplanes, engines, transport, wireless and all the paraphernalia of a modern air force.

The Royal Air Force has always been a highly technical Service. Its equipment verges on the experimental, and, in order to save weight, materials have to bear stresses which make rigid inspection essential. It is not surprising that in September, 1939, in maintaining the high quality of our aircraft and components we were in no position to produce them in any great numbers. After that date, as everyone knows, the struggle to produce more and more fighters, bombers and trainers was unrelenting, with Beaverbrook driving industry to ever-increasing targets at which they gasped and he grinned. Never were there enough aeroplanes.

In this country the Directorate of Repair and Maintenance in the Ministry of Aircraft Production, controlling an extensive civil and Service organization, dealt with the major repair of all R.A.F. equipment, augmenting substantially the flow from new production. During the Battle of Britain more than half the aircraft engaged came from this source and in the early days of the U-boat menace we relied almost entirely on salvaged Catalinas for aerial escort to our convoys. A parallel Directorate, that of Servicing and Maintenance, was responsible for the serviceability of all aircraft in the field and for service repair depots overseas.

In brief, the functions of these two organizations were to salvage and repair crashed and time-expired aircraft and equipment, and to keep machines airworthy. These are extremely important functions, for aeroplanes are useless if they cannot fly, and unless damaged equipment is repaired and passed back into service the drain on new production becomes extortionate. These things seem obvious enough now. Yet it was a lesson we had to learn in a hard way. True, we quickly got the factories, the tools and the skill, but we were always limited by the lack of spare parts. Wherever R.A.F. equipment was to be repaired or serviced, men wrangled over the mysteries of the universal spares famine with a fervour born of desperation. In the factories and in the desert, in office and workshop, in conferences and in high places, the burning question was:

"WHERE ARE THE SPARES?"

* * *

The provisioning of spares is a complicated matter.

Consider an item such as an aero engine which has to be maintained in good order for its natural life or such lesser period as may be terminated by violence. Let us assume that certain preliminary data have been gathered either by the mathematical application of the laws of probability and logistics or by the often equally successful method of intelligent guess. Such matters, for instance, as how many engines will be in use; where they will be used; how often they will be used; how many will be lost over enemy territory; how many of each spare part are needed per hundred engines; and so forth. We will pretend that we have answers to these questions. It *only* remains to make the spares and get them to the right place at the right time.

Particularly in war time, every machine tool in a factory must be loaded to its full capacity. Idle time, day or night, except for maintenance and setting up, is a dead loss. So the production engineer aims for balanced production. If the order is for a thousand engines each with fourteen pistons, one crankshaft, fifty-six valves, and so on, then in a given time the factory must produce a certain multiple of these quantities. It is no good making certain major parts in advance of others—that only holds up the assembly line. Again, if the order for a thousand "Hush" engines has been completed and the shops retooled to produce a thousand "Shush" engines, you can-

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not expect the engineer suddenly to redeploy machines to make spares for the "Hush" engine.

This, then, is the first part of our lesson:

Spare parts required must be intelligently anticipated and produced in sufficient quantities concurrently with the item of which they form a part.

In theory, this should solve the production part of the problem. In practice, two more difficulties creep in.

Firstly, in the drive for production of new engines (or what you will) the manufacture of spares has a retarding influence. The M.A.P. Director, who is responsible for production of engines, urges his factories to turn out more and more *and more* engines per week. Spares don't appear on his production sheet at the end of the week when, with shaky hand, he places this statement before the Minister. So, if a machine tool breaks down or there is any question of priority, spares take second place. The Director of Repair and Maintenance can plead (and show, given the chance) that more spares mean more airworthy engines. But pleadings, threats and arguments are so much waste of effort—they should be unnecessary in a well-run organization.

So emerges the second part of our lesson:

Production and repair must be co-ordinated under a single authority to gain the maximum planned output from both sources.

Finally, there is a purely mercenary angle which arises in certain cases. It is the custom in certain factories to pay operatives on a basis of items completed in a certain time. Spare parts do not count. The indication is obvious; the remedy not so apparent. But it should not be beyond the ingenuity of rate-fixers to overcome this difficulty.

I have covered only certain aspects of the spares question. To deal with the matter exhaustively under the triple headings of "Planned Provisioning," "Planned Production" and "Planned Distribution" would be an interesting but lengthy business. No doubt it is already in capable hands. It is a problem that confronts the manufacturer of any commercial engineering product from a vacuum cleaner to a motor-car, and on the whole we cannot complain of his service. We have only to look at the present spares position in the automobile industry, however, to see what a paralysing position could arise in war. Looking back, one is appalled at the narrow margins by which catastrophe was averted. Goodness knows that spares were difficult enough for British products, but what of the equipment that came from the U.S.A. on the "cash and carry" basis? We were in a sorry state then. The scramble for dollars was just as grim—more grim—than it is now. Sometimes there would be a small packet of spares in the cockpit of a Hudson or a Tomahawk: often there were literally no spares at all to service the trickle of machines that reached us. Either we hadn't enough cash to buy them or the U-boats put them in Davy Jones's locker. All praise to the Service and civilian technical officers by whose ingenuity parts were salvaged and bricks made without straw.

We may never again have to use crashed propellers straightened with motor jacks in fighters defending our island; we may never again send patrols over the Atlantic with salvaged ball races in their reconditioned magnetos; propellers, magnetos and the equipment of yesterday pass rapidly out of date. But as time marches on, mechanization spreads like a disease, and if, hand in hand with mechanization, we do not have first-class maintenance, like a disease it may exterminate us. **And the prerequisite for good maintenance is an abundant supply of "spares."**

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Planned Flying and Planned Servicing

By SQUADRON LEADER T. S. KITCHING, D.F.C.

THE term "Planned Flying and Planned Servicing" has been used with increasing significance during the past few years. The system it describes has been the subject of much misunderstanding and prejudice, but it has nevertheless made steady progress, and there is no doubt that a fuller understanding has converted many of its former antagonists.

The system can be traced back to the pre-war expansion period, when a planned servicing scheme was adopted by Flying Training Command. It needed several years of study by the technical staff of this Command, however, to evolve a system for measuring the needs and the effect of a given intensity of flying: planned servicing then became a partner to planned flying. The system was introduced into all Flying Training Command units in 1941.

In 1942 a Whitley squadron of Coastal Command played the role of guinea-pig in an experiment to find out whether P.F./P.S. could be applied to an operational squadron. Despite the inevitable difficulties, the experiment proved beyond doubt that a flying plan, integrated with a servicing plan, would produce a much higher total effort. The operations on which the squadron was engaged called for a regular daily effort, but it was soon found that the system could be applied with success to squadrons whose effort was far from regular, and in 1943 it was adopted throughout the whole of Coastal Command.

In 1946 it was decided that Planned Flying and Planned Servicing should be introduced throughout the whole of the Royal Air Force.

The Aim

The aim of P.F./P.S. is to get the maximum useful effort out of available resources. The basic method for achieving this aim is to assess the flying effort required against the resources that will be available, to make flying and servicing plans for producing that effort, and to see that the plans work.

What is the difference between the old system and the new? Perhaps the essential difference can be expressed by saying that under the old system the Group or Command Headquarters said to the unit commander: "This is the job we want you to do. We consider it to be within your unit's capacity; if you are unable to do it we shall want to know why." Under P.F./P.S. the Command Headquarters says to the unit commander: "Here is your task; we have assessed as accurately as we can the number of aircraft and men you will need for this amount and this kind of flying; you will be given just the right number of each for the job. Provided you can keep to the flying plan, and the chief technical officer can keep to the servicing plan, you should be able to manage. We shall want to know how you are progressing at frequent intervals so that we can make any adjustments that may be required." That may be an over-simplification; the essential point is that P.F./P.S. gives you more for your money than the old system did. The output is still a long way from the theoretical maximum, because the system must be flexible; there must be some "built in" insurance; the commander must be allowed his freedom of action.

How much "slack" to allow depends on the role of the unit; a static unit with a steady daily flying effort can generally produce more flying hours per aircraft and per servicing man than a unit whose opportunities for flying depend upon the approach of enemy aircraft, or the sailing of enemy convoys. Nevertheless, the application of P.F./P.S. to the Coastal Command strike wings during the war proved that it paid dividends, even with those squadrons whose flying effort was subject to the most violent fluctuations.

Setting the Task

Planned Flying and Planned Servicing is primarily a matter between the Command Headquarters and the unit. The Air Ministry issues directives to Commands, setting out their commitments. From these directives the Command Staff allocate tasks to individual units, and either provide the unit with resources commensurate to the task, or define the task according to the unit's current capacity. The unit's flying and servicing plans are set out on a task chart; the data for these plans being based on statistical analysis of present and past experience. Needless to say, these data must be applied with common sense and imagination.

The task chart tells the unit commander what rate of effort is expected from the unit's resources and what are the factors, as seen by the Command Staff, on which the plans have been based. It is the responsibility of the unit commander

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and his staff to plan the execution of the task set and to put the plan into operation.

It is only at the Command Headquarters that the complete picture of a Command's resources, activities and achievements can be studied, and it is there that the allocation to units of task and resources must start. Where, then, do the Air Ministry and the Group Headquarters come into the picture? Briefly, the Air Ministry is concerned in knowing what rate of effort can be obtained from given resources, and hence the establishments required for given commitments. The Group fulfils its normal function as a subordinate formation, and acts as a filter between the Command and the unit. In order to simplify the picture, the Group's part in the scheme has been omitted from this article.

Planned Servicing

"Planned flying" and "planned servicing" are regarded nowadays as inseparable partners. It is planned servicing, however, that provides the biggest direct contribution to economy of aircraft and man power. Since the early days of the war, servicing man power has been the major factor limiting output of flying hours. Planned servicing was, therefore, designed primarily to increase the flying hours per servicing man, but in the process it showed the way to increased flying hours per aircraft.

The first essential was to ensure a regular supply of work for the men, so that they could be employed continuously instead of by fits and starts. The major contribution to this, of course, was planned flying, but more about that later on. Another was a "pool" of aircraft as a buffer between the flying wing and the servicing wing, where unserviceable aircraft could wait their turn for attention, and where serviceable ones could wait to be absorbed by the flying wing. Under ideal conditions, roughly half the aircraft in the pool should be unserviceable "awaiting man power." The state of the pool studied in relation to a unit's current flying output may provide one indication of the unit's servicing efficiency. A marked absence of aircraft awaiting man power may possibly indicate too many servicing men for the flying task; conversely, too many awaiting man power may point to bad servicing organization or too few men.

Development of servicing organization and methods has also increased the output per man. Centralization of servicing, originally as between units on a station, but often today as between stations in a Group or Command, has given a more even distribution of load, besides proving more economical in servicing equipment. For certain types of servicing, centralization is the only way, but the degree of centralization that is desirable for general servicing on a station has been subject to some discussion. From the technical point of view, fully centralized servicing is the most efficient; it is sometimes criticized, however, on the grounds that it prevents junior general duties officers from obtaining experience in handling men.

Improvements in servicing methods, notably the "Planned Inspection," also play their part in the drive for servicing efficiency. Rationalization of servicing schedules and co-ordination of effort have reduced both man-hours spent on routine servicing tasks and the time that the aircraft is withdrawn from flying. Hence, more flying from fewer aircraft and fewer men.

Planned Flying

It will be obvious that planned servicing cannot be fully effective unless the technical staffs know beforehand how much work to expect. Planned flying gives them the data for assessing the optimum requirements of men, aircraft, equipment and accommodation. The flying plan defines the rate and nature of the flying effort required. How accurate that definition can be depends on the nature of the task. It may be a potential task, as for a fighter defence squadron, or an actual task, as for a training unit with a regular flow of pupils. The flying plan will generally portray the average effort required over a period; it is a guide to the unit commander in his day-to-day planning, and it should not be regarded as an attempt by the Command Staff to take over his job.

Forward or Backward Planning

From what has been said so far it may appear to the reader that once the task has been defined it is then merely a matter of providing the resources to fulfil it. That would be the ideal way, but in practice it is nearly always necessary to reduce the desirable to the feasible. It is more often the practice to "plan in reverse"; that is, to assess the unit's resources and then match the task to them. Where effective strength is fluctuating well below the establishment, this process sometimes needs to be repeated from month to month. The essential principle is still observed, however: tasks and resources must be planned and matched.

Analysis of Progress

Having made the plans the Command Staffs must see that they work. This aspect of P.F./P.S. is sometimes overlooked, but it is a simple fact that unless the execution of the plan is frequently reviewed, and unless any faults thus disclosed

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are remedied, unforeseen developments may reduce the plan to chaos. Day-to-day progressing must be carried out at the unit, and sufficient information fed to the Command Headquarters for the progress of individual units in the Command to be compared, analysed and recorded. The analysis of this information gives Headquarters Staffs a continuous picture of the current situation, and provides the data for future planning.

Conclusion

There have been, and probably still are, those who suspect P.F./P.S. They regard it as an attempt by the Engineers to "pin down" the Air Staff, to stifle their freedom of action. That is wrong; it is merely a matter of defining, as accurately as possible, what is to be done. If the task is capable of precise definition, then the right resources for the job can be assessed. If not, let it be defined in whatever terms are applicable; some plan is better than no plan at all. Dr. Gordon, the scientific adviser to whom much of the credit for the Coastal Command experiment is due, wrote: "The tradition of the R.A.F. is that the operational staff instructs and the rest execute. With limited resources, instruction without detailed knowledge may lead to an uneconomical use of resources. The Air Staff demand and expect operational freedom, but as an eminent philosopher has said: 'Freedom is the recognition of necessity.' By recognizing the necessities imposed by limited resources, operational staffs will get a greater freedom of action through a more economical use of these resources."

The Contribution of Engineering Inspection to the Work of the Service and Supply Ministries

An abbreviated version of the Author's Presidential Address to the Institution of Engineering Inspection, delivered on 6th June, 1947

By AIR COMMODORE J. SOWREY, A.F.C., F.R.Ae.S.

INTRODUCTION

THE practice of engineering inspection is not by any means confined to industry as such, and my aim in this paper is to give you a short survey of the application of its principles and its methods as exemplified in the work of the Service and Supply Ministries.

THE SUPPLY LINE

Equipment used by the Fighting Services normally travels along what is known as the Supply Line in four well-defined stages or processes, *viz.*:

(*a*) Design.
(*b*) Production.
(*c*) Holding.
(*d*) Use.

Design requirements having been formulated by the appropriate Ministry, it may be said that broadly speaking, design and production are mainly undertaken by industry, whereas holding and use are the concern of the Services. This statement is subject to certain qualifications (*e.g.*, in some instances the detailed design, as well as production of special equipment, is carried out entirely by Government Departments), but the general scheme of things is, I think, well understood and appreciated throughout the engineering world. What I fear is not appreciated, however, is that the process of inspection is an all-embracing one, the tentacles of which stretch from one end of the supply line to the other.

For instance, in the design stage, inspection is involved in the building of prototypes and particularly in the assurance that the correct material is being used in their construction. In the production stage the necessity for inspection is too well known for comment but the equal need for well-organized inspection in the holding (*i.e.*, Storage Depot) stage and in the user stage is perhaps not so well understood.

In the holding stage, complete aircraft, tanks, guns and so on, and their spares, have to be stored and maintained. This involves periodic inspection for deterioration, inspection and testing of equipment returned from units and the inspection of modifications and adjustments to equipment held in store. In the user stage, continuous and thorough inspection and maintenance is imperative if mechanical failure is to be avoided. Aircraft operation, in particular, calls for the highest degree of organization and care in this respect, as the results of mechanical breakdown may prove most serious.

It is sometimes said that inspection is a production operation, which is undoubtedly true in

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the sense that production and inspection must work hand in hand together if the best quantity plus quality results are to be assured. It is also true that inspection is to some extent a design operation and too, in a much greater degree, a holding operation and a user operation.

The morale of the actual operators of Service equipment (that is, the fighting men) is well known to be largely determined by the confidence they can place in the weapons they use. It is, therefore, a matter of prime importance that inspection should ensure a uniformly high standard of quality throughout the supply line and that no weak links exist in any part of the inspection chain.

In what has been said above, it will be noticed no reference has been made to Repair. Repair and overhaul is a subsidiary stage which, of course, is called into being after articles of equipment have been used and have become either damaged or unduly worn. Repair may be undertaken either in industry or in the Services, but in any event the articles are normally ploughed back into the supply line at the same point as new-manufacture articles join the holding stage. Inspection during repair can—just as with the other supply line stages—be regarded as a repair operation and thus we see that the responsibilities of inspection cover in one way or another the whole gamut of design, production, holding, use, and then, where necessary, repair.

In diagrammatic form, therefore, the supply line can best be shown as follows:

Design	
Production	
Holding	Inspection
Use	
(Repair)	

SYSTEMS OF INSPECTION

Before proceeding to a brief survey of the inspection set-up in each individual Ministry, it is as well, I think, to look for a moment at the general structure and lay-out of inspection as conducted in industry and the Government Departments as a whole.

Basically, two systems of inspection are employed, *viz.*:

(*a*) The Gang system.
(*b*) The Separate System.

In the former the charge-hands and foremen who control the men and machines that do the work are also responsible for inspecting it, whereas in the latter, or Separate, system, the organization for inspection is quite separate from that of doing the work, and the foremen and charge-hands who organize and control the work in hand are not responsible for inspecting it. These two systems of "Basic Inspection" are both used in industry no less than in the Service Departments, backed up in some instances by "Superimposed Inspection," to which reference will be made presently, but in passing it would be as well to emphasize that the Separate inspection system has very largely ousted the Gang system for all manufacturing and repair work, and that even in the operating field—particularly in civil aviation—Separate inspection is now recognized as much superior to the Gang system in securing freedom from mechanical failure.

Turning now to "Superimposed" inspection, this system, as its name implies, is superimposed on one or other of the two basic systems, and takes the form of an overseeing or checking organization. It is, of course, far more important to superimpose a checking organization on the Gang system of inspection than on the Separate system, for as will be readily appreciated, the supervisory personnel employed under the Gang system must inevitably have their attention diverted from matters of quality in order to organize and progress the work and obtain the required output. Under the Separate system, on the other hand, the inspectors are enabled to devote the whole of their energies and attention to inspectional matters and a system of "Superimposed" inspection is normally superfluous in so far as the *internal* needs of a particular manufacturing or operating firm are concerned.

"Superimposed" inspection from an *external* source is, however, another matter. An illustration of the working of such a system is provided in the relations between a Government Inspection Department and firm's inspection in the supervision of Government contracts. Whether the firm concerned is working basically to the Gang system or the Separate system, Government inspection is superimposed from an outside or external source and does not derive from the internal requirements of the firm itself.

The various systems of inspection can, therefore, be shown in tabular form as:

BASIC INSPECTION
- Gang System.
- Separate System.

SUPERIMPOSED INSPECTION
- Internally imposed.
- Externally imposed.

THE SERVICE AND SUPPLY MINISTRIES

Principally as a result of lessons learnt in the last two wars, Governmental control of the Fighting Services and of the supply of their equipment has, in recent years, been consider-

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ably modified. Prior to 1939, the requirements of the Services were met by three Ministries, the Admiralty, the War Office and the Air Ministry. In 1939, the Ministry of Supply was hived off from the War Office and in 1940 the Ministry of Aircraft Production from the Air Ministry. These two Supply Departments have now been amalgamated under the name of the Ministry of Supply, and only a few months ago a Ministry of Defence was superimposed on the whole system. We are now, therefore, in the position that the material requirements of the Fighting Services (and also the direction of industry in this respect) are catered for by five Ministries, *viz.*, the Ministry of Defence, the Admiralty, the War Office, the Air Ministry and the Ministry of Supply.

In describing in brief the activities of these various Ministries in the inspection field, perhaps I may be pardoned for taking the Air Ministry first.

AIR MINISTRY

The origins of inspection in the Air Ministry date back to 1913 when the Aeronautical Inspection Department of the War Office was formed under Colonel Fulton, R.A., at what was then the Royal Aircraft Factory, Farnborough. This organization rapidly expanded during the 1914-18 war and was taken over by the Air Ministry in April, 1918, when the Royal Flying Corps and Royal Naval Air Service were amalgamated to form the Royal Air Force.

After the war when the R.A.F. was established on a permanent basis as a third Fighting Service, the A.I.D. was also set permanently on its feet as the Inspecting Organization for all aircraft and aircraft equipment manufactured for military or civil purposes. It was also made responsible for inspection at the four main Holding Units of the R.A.F.

Considerable expansion took place during the 1935-39 years and when in May, 1940, shortly after the outbreak of the second World War, the Ministry of Aircraft Production was formed, all inspection responsibilities in the design, production, holding and repair stages were transferred to the new M.A.P., leaving the Air Ministry responsible for user inspection only. Later on, all inspection activities in the R.A.F. (as distinct from those in industry) were handed back to the Air Ministry. The present position, therefore, is that inspection in the R.A.F. is covered by two Air Ministry Directorates, namely (*a*) the Directorate of Aeronautical Inspection Services; and (*b*) the Directorate of Servicing and Maintenance, the former being responsible for inspection in the holding and repair stages and the latter for inspection in the user stage. Holding and repair inspection is organized on the Separate system, whilst user inspection utilizes the Gang system.

ADMIRALTY

Inspection in the Admiralty, unlike that in the Air Ministry, is organized in departments which deal with specific types of equipment, for example, the Corps of Naval Constructors who are responsible for the design and construction of warships as a whole, have their own inspectors and overseers at the various shipyards. The Engineer-in-Chief's Department, whose responsibilities cover engines, turrets and other engineering equipment, also have their own inspectors and overseers. The Naval Ordnance Department, similarly, has its C.I.N.O. branch, and the Naval Air Organization its N.A.I. branch, and so on. Mention must also be made of the excellent Test House facilities, such as the Bragg Laboratory at Sheffield, which the Admiralty provides for the use of its various Engineering and Technical Departments.

Most of the inspection in the Navy itself and its dockyards is carried out on the Gang system. Inspection by the Admiralty in industry is conducted on the "Superimposed" system, varying from 100% to a smaller proportion of check inspection as circumstances demand.

WAR OFFICE

Prior to the formation of the Ministry of Supply in 1939, the War Office was responsible for the inspection of its stores and equipment being made by industry as well as for the inspection of stores being held, repaired or used in the Army itself. Now, however, the War Office responsibilities in the inspection field are for all practical purposes confined to the latter category only.

Inspection is organized on a "corps" basis, that is to say, the Royal Armoured Corps, the Corps of Royal Engineers, the Royal Corps of Signals, the R.A.S.C., the R.A.O.C., and the R.E.M.E., each have their own organizations for inspection which is almost wholly conducted on the Gang system.

MINISTRY OF SUPPLY

The Inspection Departments of the Ministry of Supply (which now includes the late Ministry of Aircraft Production) number seven all told—six *ex*-War Office and one *ex*-Air Ministry. They are as follows:

Director of Aeronautical Inspection.
Director of Fighting Vehicle Inspection.
Chief Inspector of Armaments.
Chief Inspector of Electrical and Mechanical Equipment.

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Chief Inspector of Stores.
Chief Inspector of Clothing.
Chief Chemical Inspector.

As these Inspection Departments exist primarily for the purpose of supervising Government contracts, the system of inspection employed is naturally one which is independent of, and superimposed upon, firm's inspection.

There has, quite rightly, I think, been a tendency in recent years to rely more and more on the efficacy of firm's inspection and to cut down Government supervising staffs to a minimum. This results both in economy and efficiency, for it encourages the firms to take a greater self-interest in the quality of their own products and they come to realize that the burden of basic inspection rests fairly and squarely where it ought to rest, namely, on the shoulders of Firms' Inspection Departments.

The Ministry of Supply has many excellent Test Houses and Laboratories at its disposal, of which particular mention should perhaps be made of the Aeronautical Test House at Harefield.

MINISTRY OF DEFENCE

The Ministry of Defence was brought into being on 1st January this year for "the formulation and general application of a unified policy relating to the Armed Forces of the Crown as a whole and their requirements." This new Ministry is still in embryo form but there is little doubt that it will, in due course, exert a very considerable guiding and co-ordinating influence over the organization and conduct of inspection in the four Service and Supply Ministries referred to above.

CONCLUSION

The objective of design is to give the actual user an article which is the best—*in all the circumstances*—that can be produced. *In all the circumstances* because "the best is the enemy of the good," and it frequently happens that, particularly in time of war, it is far more important to provide the users with large quantities of a moderately good article than with a restricted quantity of the very best. Nevertheless, whatever may be the decision of higher authority in this respect, one thing is clear, namely, that once the specifications, and drawings including instructions for testing and use are drawn up, Inspection is the instrument by means of which Design ensures that its intentions and requirements are met by Production, by the holding authorities and even by the user himself. Or, to put the same point in another way, it may be said that provided a piece of mechanism is adequately designed to take the stresses and strains it has to bear, and provided it is not ill-used in service, then mechanical failure can only result from faulty inspection—that is, faulty detection of bad work done at some stage in the supply line, combined, it may be, with faulty assessment of the rectification needed to maintain the mechanism in a serviceable condition.

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The Service at the Unveiling and Dedication of the Battle of Britain Chapel

IN WESTMINSTER ABBEY ON 10TH JULY, 1947

THE ADDRESS BY HIS GRACE THE LORD ARCHBISHOP OF CANTERBURY

He that clings to his life, shall lose it: and he that spends his life for my sake shall find it.—ST. MATTHEW, 10, 39.

OUR thoughts go back to our unforgettable experience of the Battle of Britain—when day by day we saw the strange and dreadful conflict fought out far up in the skies, and night by night awaited the news of the number of aircraft, theirs and ours, destroyed. For three months England, our enemies and the world hung upon the actions of those young men, and of their comrades who made and serviced the machines in which they fought. It seemed then, it seems now, that they alone stood between us and the abyss. Five long years were to pass before our victory was achieved; but it was made possible only by the splendour and the sacrifice which by a narrow margin denied hostile access across the Channel to our shores, and preserved inviolate this bastion of freedom.

So many of you are thinking especially of one or another, son, brother, father, friend—among those who seven years ago revealed their splendour and made their sacrifice. Not less than others, though with a deeper emotion, you join now in the proud thanksgiving, in the grateful recollection with which this chapel is to be set apart for all time to make remembrance before God of an incomparable act, in which these young men purchased with their lives this England and so much besides.

They were not all of one birth, though they were all of one mind and will. Numbered among those on this Roll of Honour are men from the Colonies, from Canada, New Zealand, Australia, South Africa, Poles, Czechoslovaks, Belgians and one American, the forerunner of a great host who were to be joined with us in the struggle and the sacrifice. But of the 1,495 pilots and aircrew on the Roll all but a hundred or two were from the United Kingdom, in Fighter Command, Bomber Command, Coastal or other R.A.F. Command, or the Fleet Air Arm, fighting above the land which was their own home. England had entered—this dear and rich possession of English scenery and life and ways had entered—into their lives as it has entered into our own. They gave all, that it might endure, a free possession for men who are free and know how to use their freedom nobly. How do we think of them now? If we remain within the narrow limits of our natural relations to them, all we can say is that they are gone,

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leaving brief memories to us who in a short time will be gone also—and a tale to be told down the diminishing corridors of time. Does that narrow belief equip us to meet on equal terms the memories of the demands of such a day and generation as this?

We make their memorial here in Westminster Abbey not only because it enshrines so much of our past but because it is the shrine of Christ the Lord. We look back with thanksgiving because we look up and in the faith of Christ can follow our brothers across the barrier of death with humility and hope.

We follow them—for this we know that in that other vast Kingdom where God is no more veiled they are in their own persons. We follow them with humility for ourselves and for them, for in the pure light of God's Kingdom all that you or I or these friends of ours can say before God is: "Lord, be merciful to me, a sinner."

We follow them with hope: for indeed to lay down life in the last defence of home, of country and of right is man's greatest act: and God knows what it means—for Christ made the supreme act of love for us Himself. To cling to life is to lose it: he that spends his life for my sake shall find it. That is the Law of Life which God has made and has Himself obeyed. We can trust to God's love those who obeyed this law of His to the uttermost.

So as we look back with proud recollection we look up with humble confidence, knowing that no act of sacrifice is wasted or ignored, since it bears the hall-mark of Christ, and no true labour is wasted: for in God's eternal reckoning it endures and bears fruit. So are we equipped to look out to the demands which every day makes upon us and to meet them in a faith which draws inspiration from those who gave all for us, and confidence from Him who carries all faithful work to its fulfilment in God.

This is a bad time for all who would cling to their lives; an invigorating time for all who will spend them for true ends, truly seen and faithfully pursued.

These our brothers gave their youth in a moment of intense combat; but they could only do so because they had submitted themselves to long training and discipline. Their dedication was made, as it was made by those who survived, in that training and discipline of spirit which enabled them to do the next thing given them to do faithfully and fearlessly, without thought of self.

So doing, they saved England and laid the first stone of that victory which was to save the world from its dire peril. So by God's providence they obtained for us the chance, the choice, to build again to redeem life to nobler ends.

Remembrance here of them, thanksgiving for them and for the decisive act of deliverance which they wrought, is and must always be a solemn dedication too, that we may be so trained and disciplined in spirit that we may do the next unheroic things given us to do faithfully and fearlessly, that we may obey Christ's law of life, His law of the spirit—"He that clings to his life shall lose it: he that spends his life for Christ's sake—for the true enduring things of His love and goodness and brotherly care offered to God and owned by Him—he shall find his life here and hereafter."

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R.A.F. Flight over London on "Battle of Britain" Day

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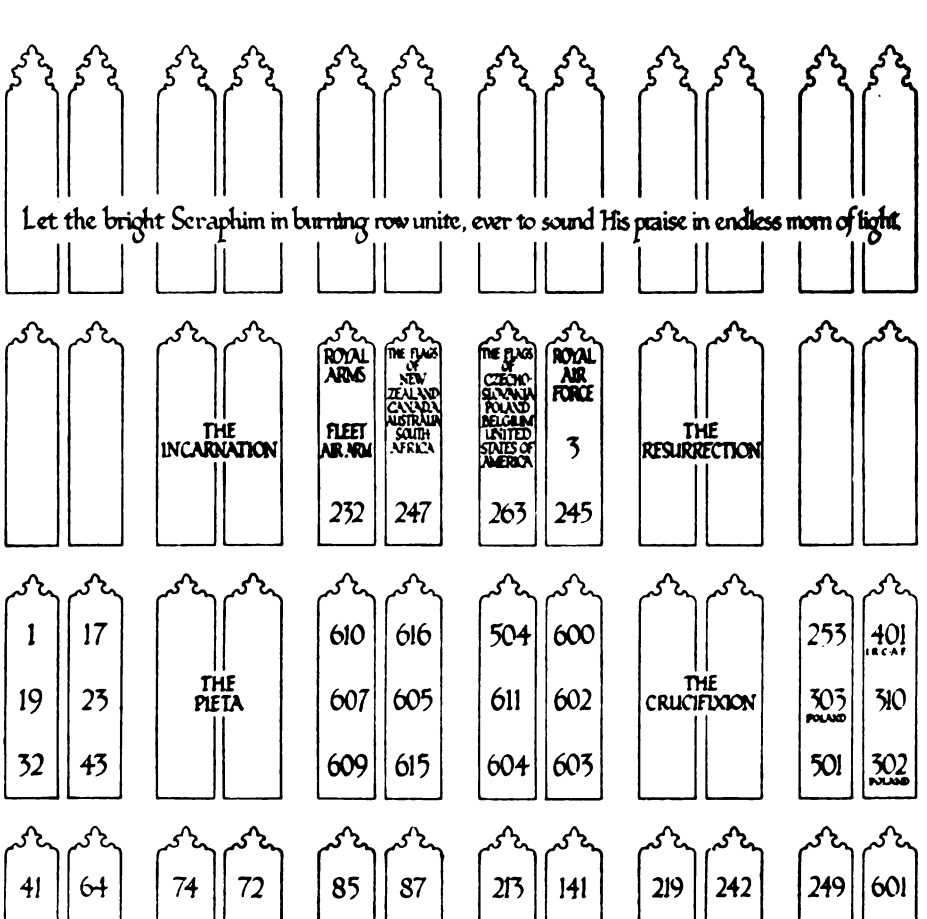
BATTLE OF BRITAIN MEMORIAL WINDOW

KEY PLAN



All Fighter Squadrons which took part in the Battle of Britain are represented in the window by their badges, and the numbers of these Squadrons are shewn above.

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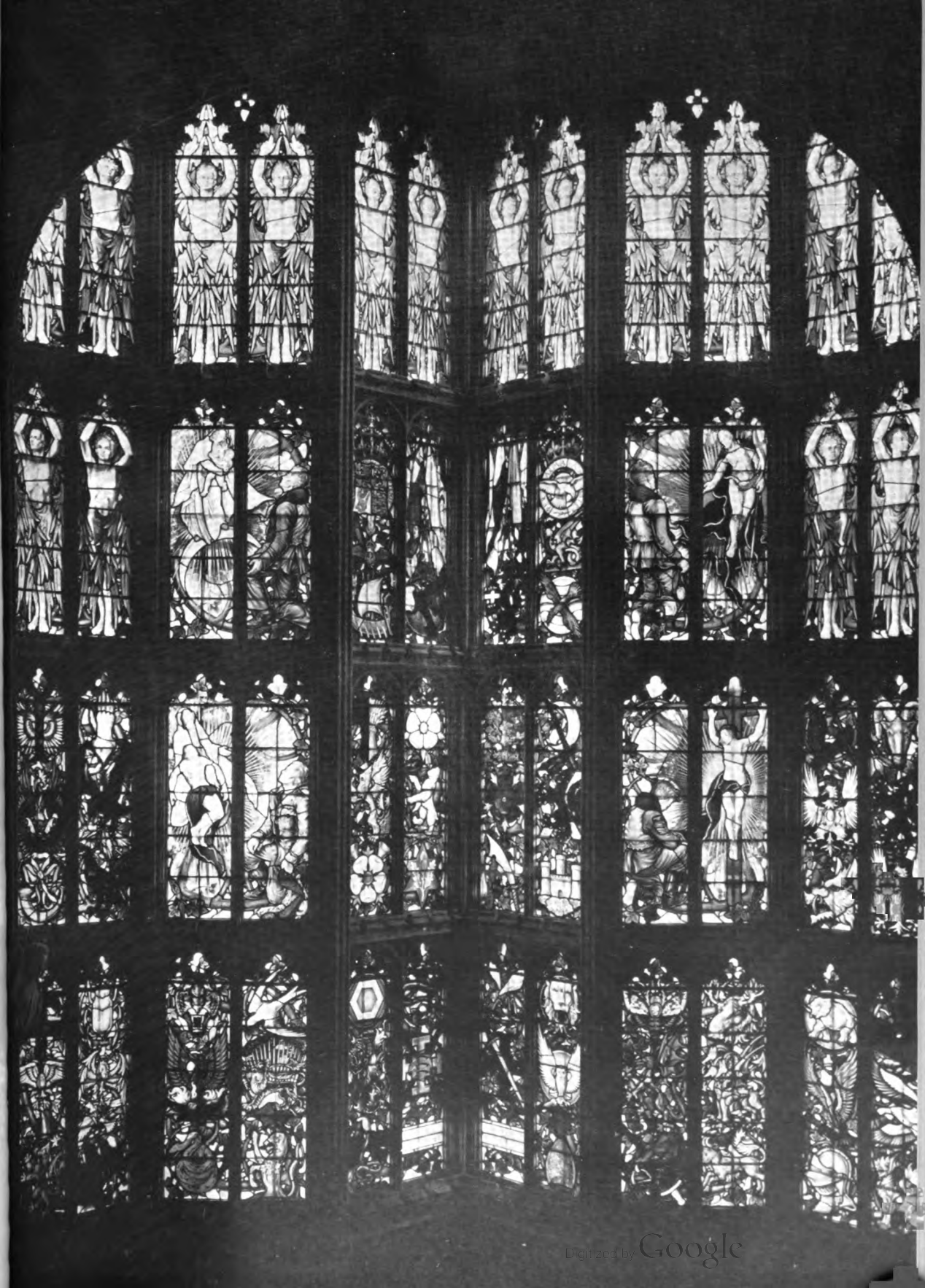

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THE SOUTH WALL

The niches on the south contain figures of St. Edward the Confessor, founder of the Abbey; St. Peter, its patron saint; and St. Edmund, king and martyr

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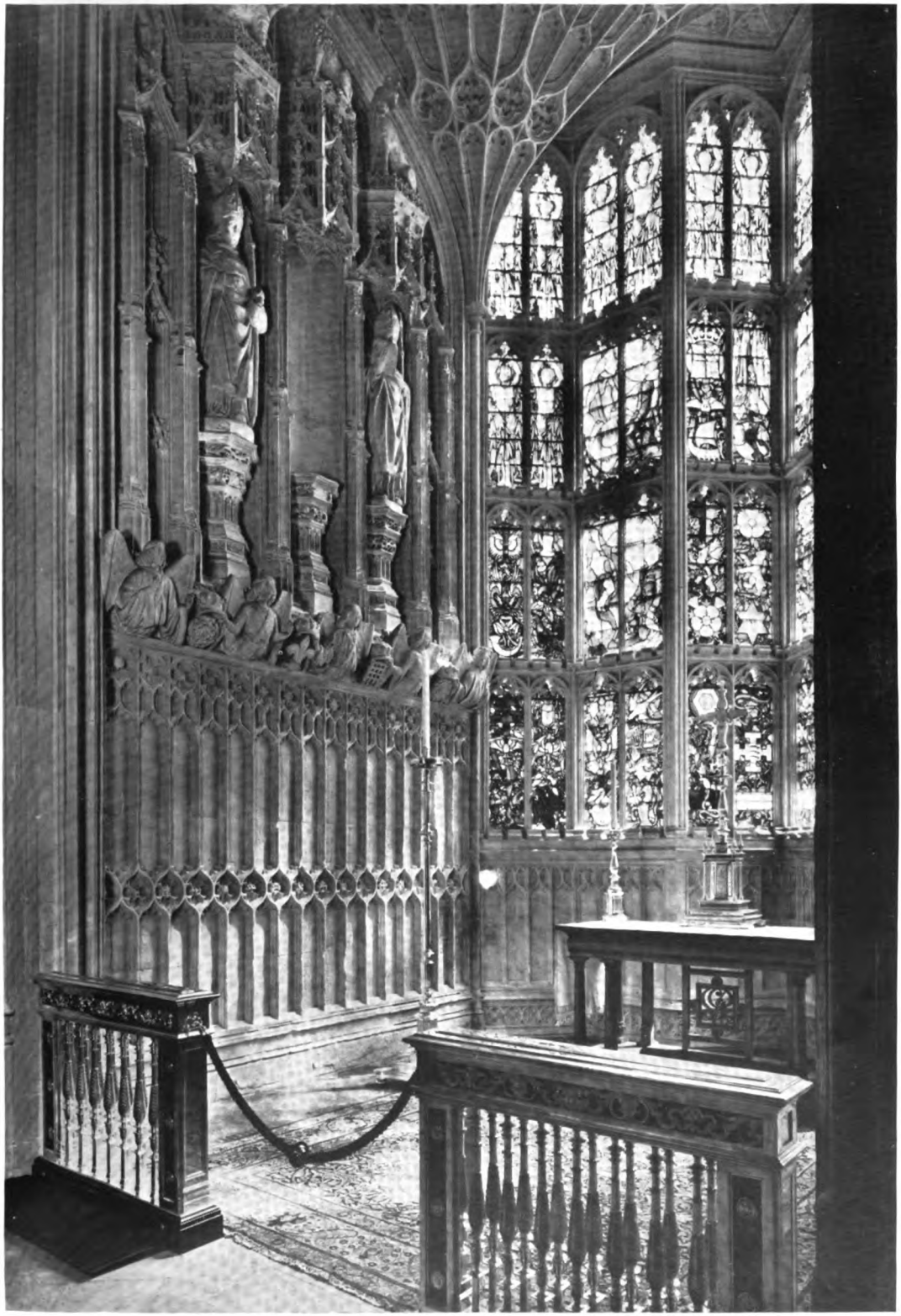

THE NORTH WALL

The niches contain figures of St. Thomas of Canterbury and St. Nicholas of Myra, who may perhaps be regarded as the patron saint of youth. The centre niche, empty, was intended for a figure of Henry VI

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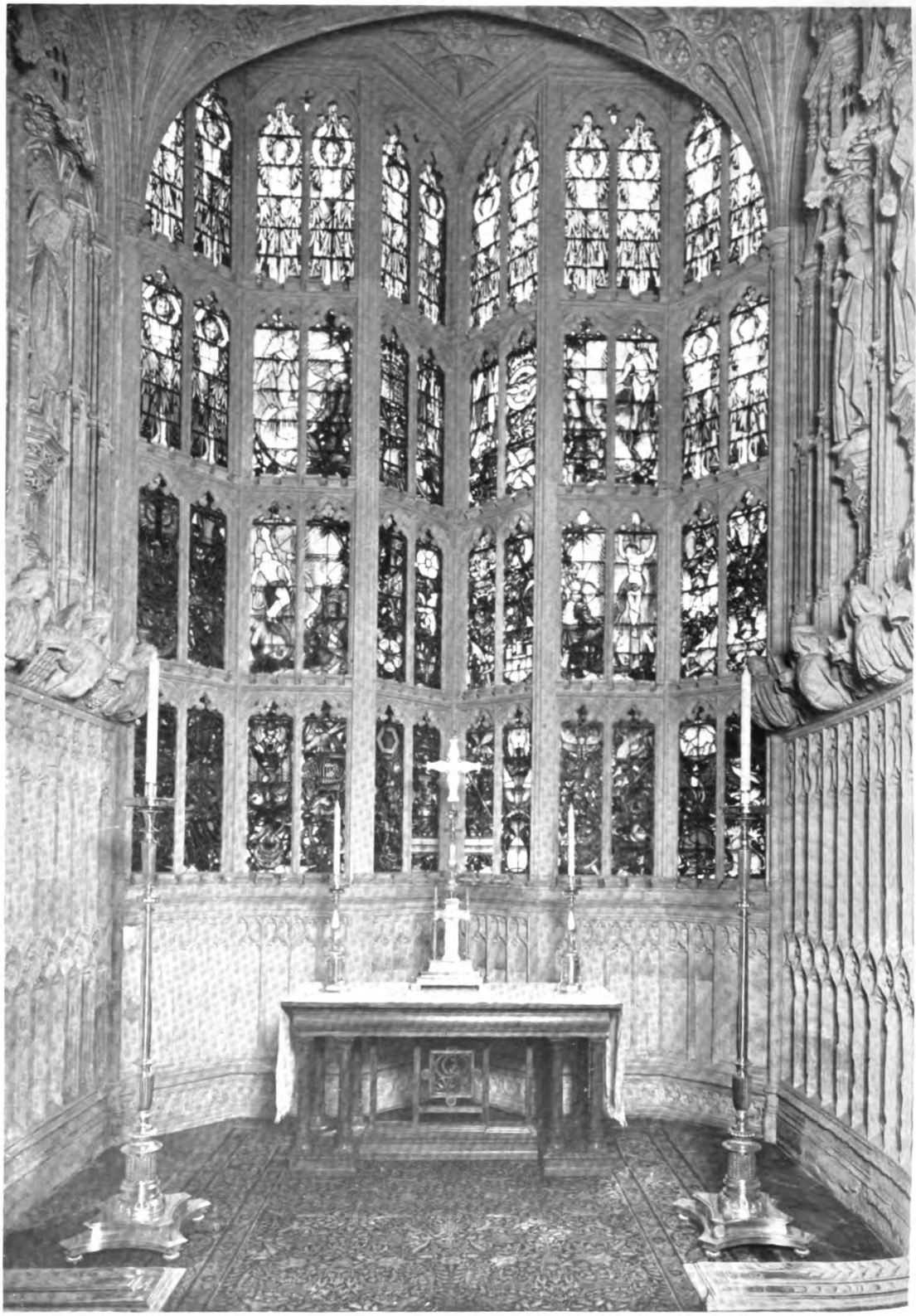

THE CHAPEL

The Chapel, built between 1503 and 1519, is the easternmost of the five small chapels forming the chevet of Henry VII's Chapel—the supremely fine example of Tudor Gothic which Leland called orbis miraculum (wonder of the world)

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Battle of Britain Memorial

ON 10th July His Majesty The King unveiled a window in one of the chapels of Westminster Abbey. This window, composed of forty-eight lights, is of singular beauty, and is dedicated to the pilots and other aircrew who lost their lives in the Battle of Britain. The chapel which it adorns is the easternmost of the five small chapels which form part of Henry VII's Chapel, that supreme example of Tudor-Gothic architecture which has been well called "the Wonder of the World."

The remainder of the window symbolizes the Incarnation, the sacrifice of the mother and the widow of those who lost their lives in the battle, the sacrifice of the pilot himself, the vision of the Resurrection and the pilot's triumph.

Throughout the background of the window a rose tree grows, the Rose of England, the badge of Henry VII, in whose chapel the memorial stands. At the foot of the window are Shakespeare's words: "We few, we happy few, we band of brothers."

In the chapel is an altar of English walnut with silver furnishings. North of the chapel is a wrought-iron lectern on which stands the Roll of Honour. This will be a great book of rare beauty—a book of over a hundred finely illustrated pages bearing the names of the fallen, and the whole thing richly bound in blue Morocco leather. The roll contains the names of 1,495 pilots and aircrew killed or mortally wounded during the battle. Of these, 449 came from Fighter Command, 718 from Bomber Command, 280 from Coastal Command, 14 from the other Air Force Commands and 34 from the Fleet Air Arm. The names in the Roll of Honour include 1,298 men from the United Kingdom, India and the Colonies, 47 Canadians, 47 New Zealanders, 35 Poles, 24 Australians, 20 Czechoslovaks, 17 South Africans, 6 Belgians and one American.

These figures in themselves illustrate the scope of the battle. The fighting was not only over the fields of Kent. Over on the coast of France were the harbours with their stock of invasion craft of all kinds which were constantly under attack by Bomber Command. Along the Belgian shores and those of Holland and farther afield flew the reconnaissance aircraft of Coastal Command who kept watch on the movements of enemy shipping and enemy troops.

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Strategic Air Bombardment

(Continued)

By J. M. SPAIGHT, C.B., C.B.E.

II

AIR BOMBARDMENT OF CITIES AND CENTRES OF WAR INDUSTRY

I.—THE WRECKING OF THE RUHR

The Ruhr Valley

THE Ruhr valley has been for fifty years the most dangerous valley in Europe. It was the greatest centre of heavy industry and coal mining on the Continent. Its production enabled Germany to mount both her world wars. "Without the resources of the Ruhr," said Mr. Byrnes, the American Secretary of State, in his great speech at Stuttgart on 6th September, 1946, "Nazism could never have threatened the world."

Here were the minerals and the factories, the possession of which allowed Germany to amass and maintain for five years the tremendous engine of war which smashed a way across Europe from the Volga to the Pyrenees. Here were the deposits of coal and iron, the richest on the Continent, the steelworks, the armament plants, the synthetic-oil plants upon which her war economy was founded. Here dwelt and toiled the hundreds of thousands of workers whose labour was as essentially a military activity as was that of the men in the armed forces. The Ruhr was a densely populated area, and for that reason and because of its geographical situation an extremely vulnerable area in this age of air warfare.

The Towns of the Ruhr

There were many large towns within its perimeter. The largest was almost in the centre: Essen, with over 650,000 inhabitants. To the east of Essen there stood Bochum and Dortmund, and to the south-west Duisburg, with populations of 315,000, 540,000 and 440,000 respectively. Gelsenkirchen, with 333,000 inhabitants, lay just north of Bochum; Hamborn, with 127,000, just north of Duisburg, of which it could be regarded as a part. Oberhausen and Mülheim an der Ruhr (to distinguish it from the Mülheim near Cologne) were not far to the south of Essen and mustered 192,000 and 133,000 inhabitants respectively. Away to the farther south there were Düsseldorf, with a population of 500,000, Wuppertal, with a total population of 410,000 in its two parts, Barmen and Elberfeld, and Solingen, with 140,000 inhabitants.

The most famous of the great metallurgical and armament plants of the area were those of Friedrich Krupp at Essen. Hardly second to these were the Rheinmetall Borsig works, whose headquarters were at Düsseldorf, which was also the seat of the great Mannesmanröhren Werke. The Rheinische Stahlwerke at Duisburg, the Gutehoffnungshütte at Oberhausen, the Thyssen-Konzern at Hamborn, the Bochumer Verein (founded by Hugo Stinnes) at Bochum, and the Gelsenkirchener Bergwerks - Aktiengesellschaft were other huge undertakings situated in the area. There were many synthetic-oil plants scattered throughout the Ruhr. The whole valley was a hive of war industry.

Earlier and Later Air Offensives Compared

Naturally it was a magnet for air attack. Bomber Command made it a primary objective from the earliest days of the air offensive in 1940. That that offensive was less damaging than we hoped for at the time may now be admitted. Our bombing force was too weak to achieve anything beyond a nuisance value in those early days.

It was not until the big four-engined bombers —and plenty of them—the bombs of 4,000 lb. and 8,000 lb. weight, the loads of incendiaries that could be counted in hundreds of thousands, and such aids to navigation and precision of bombing as "Gee," "Oboe" and "H2S" became available in 1943, that we really could begin to wreck the Ruhr. The assault upon it which was inaugurated then was a vastly different affair from that which had gone before. How much more punishing it was was shown by the changed note of the German propaganda. Previously the line that had been taken was that our raids were futile—there was something in that—and that we were wasting our time in carrying them out. There was no such pooh-poohing of the new attack. Dr. Goebbels himself had to admit, in a

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speech at the Berlin Sportspalast on 5th June, 1943, that the Royal Air Force had caused "terrific damage" in Western Germany. "The average citizen of the Reich," he said, "has no idea of what the population there have to endure. Whoever elsewhere complains about consequences of the war should look to Essen, Dortmund, Bochum, Wuppertal and other raided areas and blush for shame."

The Two Battles of the Ruhr

The "Battle of the Ruhr" is usually regarded as having started with the raid on Essen on the night of 5th March, 1943. Actually there were two "Battles of the Ruhr," and this one of 1943 should more correctly be called the first. The second, which took place in the later months of 1944 and the beginning of 1945, was a more decisive battle. The first battle shook the Ruhr badly, sent it down more than once for the count, but the second knocked it out of the ring. The towns of the Ruhr were terribly battered in the first battle, but most of them did not cease production; indeed they increased their output on the whole, though there was an overall reduction by the end of the battle. The second sent production down to zero.

The greater results of the second battle were due in part at least to its having been more of a flank attack than the first had been, though it was a frontal attack as well. It embraced the accessories of the objectives as well as the objectives themselves. Its most profitable target was the system of communications on which the mines, steel plants and factories depended. The machinery and other equipment of the plants, etc., were too massive to be destroyed. They had been built to stand strains almost as great as those to which air attack subjected them. They stood up in a really amazing way to the terrible hammering which they received. But they depended on auxiliary services which were much more vulnerable, and it was these that broke in the end. The results were, first, that the products of the Ruhr were frozen where they stood, and, secondly, that the Ruhr was effectively disarmed in the second battle. It had only been partly disarmed in the first. Air power accomplished, in fact, what it had set itself to accomplish.

The Effect on Steel and Coal Production

"It is clear," says the report of the United States Strategic Bombing Survey (page 109), "that Germany's steel supply was drastically reduced in the latter part of 1944 and the early part of 1945, not by damage to productive facilities but principally as a result of interference with the vital utilities, including transportation, gas, water and power. Of these, transportation was the crucial factor, but damage to the power and other lines was also of great importance." There is little evidence, it states (page 108), that precision attacks on steel plants would have been more effective than the heavy area attacks which were in fact made. "Saturation bombing" was a frequent cause of substantial losses in production. Attacks of this kind caught the piping and power lines as well as the plant; precision attacks might not have done so.

The coal of the Ruhr was dealt with in the same manner as its steel. It succumbed in the end to the assault on its transport accessories. Coal was the foundation of Germany's whole war economy. Losing that she lost the basis of her war potential; and air power destroyed the basis. It did so by blocking the channels by which the coal was fed to the hungry industries of the Reich. Nearly 80 per cent. of all Germany's bituminous coal came from the Ruhr and the Saar. When that source was cut off she ceased, in effect, to be a great Power. "It seems clear," says the Survey already quoted (page 98), "that the destruction of transportation facilities, whether by area or by specific target attacks, was the major factor contributing to the collapse of the German coal economy." "The vulnerable points of the coal industry," it says later (page 99), "were the transport facilities around the mine itself, the short hauls to coke ovens and steel mills, and the longer routes to areas away from the mines. To the extent that the objective of strategic bombardment was the paralysis of German industry, the movement of coal was an ideal target." By concentrating on that target, Allied air power "achieved economic paralysis in Germany." The Ruhr was wrecked.

II.—THE BOMBING OF BERLIN

Pre-War Berlin

On the face of no capital city in Europe did the Second World War leave its disfiguring signs more plainly visible than on Berlin's. It was a transformation that was overdue. The Berlin which the pre-war visitor knew was a city which seemed to proclaim raucously the cult of war, its glory and its splendour, its contribution to Germany's greatness, its place in Germany's life and growth. He saw reminders of it everywhere: the Brandenburg Gate, with the Quadriga of Victory above it; the Sieges Allee, with its marble statues of Prussia's martial rulers; the Sieges Saüle in the Königsplatz with the Moltke statue near by; the Roon Monument in the Alsenplatz; the statues of the Silesian Wars in the Wilhelmplatz. Many

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of these memorials lie broken and dishonoured today. The philosophy of which they were the expression has sunk into dust and ashes, too.

It was the winter of 1943-44 which changed the face of Berlin. As the most important industrial city in Germany, with a population of four and a half millions, it was a magnet for air attack. Whereas the Ruhr was the greatest centre of heavy industry in Europe, Berlin was the greatest processing centre. There were in it as many priority factories as in Munich, Leipzig, Cologne, Hanover and Mannheim combined. It was also the hub of the whole German railway system. Twelve main lines converged on it. In it were situated the termini of most of the trunk lines: the Lehrter Bahnhof for Hamburg and Bremen, the Stettiner for the Baltic ports, the Görlitzer, Anhalter and Potsdamer for the south and the Schlesischer for the south-east. Alike as an industrial city and as a centre of transportation, Berlin was an objective of the first importance. Naturally, our bombers hit it again and again.

The Early Raids

They attacked it for the first time soon after midnight on 25th/26th August, 1940. It was repeatedly raided in the fifteen months that followed. The raid of 7th November, 1941, was the fifty-third which it had had up to that date. They were not very damaging raids. They were carried out by twin-engined bombers which were insufficient in numbers and in loading capacity to make much impression on a city of the dimensions of Berlin. It did suffer some damage, and the frequent alerts had their effect upon production through the interruption of work, but on the whole the raids of 1940-41 were no more than curtain-raisers for the tragedy of Berlin that was to follow from 1943 to 1945.

The city had a long respite after that raid of November, 1941. The next did not occur until the night of 16th January, 1943, when four-engined (as well as twin-engined) bombers were used against the city for the first time. There was another raid on the following night, and a much heavier one six weeks later, on the night of 1st March, when the city was attacked by a force entirely composed of four-engined bombers. Severe damage was done in this attack, the heaviest yet made. The Friedrichstrasse and the Leipzigerstrasse came off badly, many of the fine buildings being wrecked. St. Hedwig's Roman Catholic Cathedral was unfortunately gutted. We heard a lot about that from German sources, but nothing about the damage of military importance. Two big factories—the Telefunken and the Blaupunkt—which made wireless sets, were hit, and severe damage was done to the Askaniawerke, which made optical and precision instruments. Large workshops of the Klockner Humboldt Deutz A.G., engine repairers, and of the Deutsche Timken, manufacturers of roller bearings, were destroyed, and a number of other factories were burnt out or badly damaged.

The Bombing Intensified

The two next attacks, on the nights of 27th and 29th March, were less damaging. They were followed by an intermission of five months, Bomber Command's attention being absorbed during these months of short nights by the Ruhr and Hamburg. The next attack was on the night of 23rd August, when Berlin received its heaviest load of bombs up to that time—1,700 tons. There were further raids on the nights of 31st August and 3rd September, 1943. In these three raids great damage was done to the works of Siemens-Schückertwerke and of Siemens und Halske, makers of electrical equipment and machinery, and to some other factories of top priority. Then, on the night of 18th November, there began for Berlin the worst time of the whole war until the final Russian assault in 1945.

The raid of 18th November was not, it seems, as well concentrated as it should have been: the bombing was on target indicators through unbroken cloud. Four nights later (22nd November) conditions were still difficult, but this raid was highly successful. It was one of the most destructive attacks ever made upon Berlin. More than 2,300 tons of bombs were dropped and immense destruction was caused, particularly in the central area of the city. The legations of Sweden, Finland and Eire were wrecked. So were many Government buildings and multiple stores in Wilhelmstrasse, Unter den Linden, Friedrichstrasse, etc.

The Winter Battle of Berlin

There was another raid, not so heavy, on the night of 23rd November, and yet another on the night of 26th November. These, too, hurt. The raid of 23rd November was denounced by Dr. Goebbels as an example of "infamous and cynical warfare." The raid of 26th November, conducted by an all-Lancaster force, was more destructive still. It caused great damage to factories in Spandau and Siemensstadt especially. In the next raid, on the night of 2nd December, the Charlottenburg district suffered severely, as did also the Potsdamerplatz and the Anhalter Station areas. After this raid, a Stockholm message said, three German reporters who had been digging out trapped people and fighting fires all night came to the microphone with their faces

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blackened and their clothes torn, to describe the city's ordeal. It was the only way the Berliners could get news of the raid; no daily papers were published in the city on the morning of 3rd December.

A fortnight later (16th December) the centre of Berlin was badly mauled. How effective the raid was was evident from the almost incoherent outburst of the German radio on 17th December. It said:

> "The bombing of Berlin is not the last stage of inhuman warfare. It is only the beginning of something more horrible and more terrible —something that will bring the war to a frenzy or will stop it for ever. It is the beginning of German reprisals. . . . Vengeance will be of such a magnitude that we have hesitated to use it. The attack on Berlin gave birth to the energetic resolve to take revenge. . . . But then he (the enemy) had better not appeal to world credulity and accuse the German armed forces of terrorism. The enemy wished it so amid the smouldering ruins of Lübeck, Hamburg, Cologne, Bochum and Berlin. He wanted it that way, and he will get it, but in a way that defies imagination and such as he never dreamed. Then he will have to explain to his people amid their blotted-out cities and pulverized dead what induced him to destroy Europe from the air. The hour of reprisal is approaching."

The Four Weeks' Toll

The spluttering snarl, the blustering, blood-curdling threat, were the measure of the hurt that had been suffered and the disaster that had overtaken Berlin—and the tale of its misfortunes was as yet but half-told. Six major attacks had been made on it in the four weeks from 18th November to 16th December, and they had scarred and seared the city terribly. Some 3,200 acres had suffered damage of varying degrees of intensity. In the Tiergarten district, packed with Government offices, more than 60 per cent. of the buildings had been wrecked. In the Mitte district, the Whitehall of Berlin, there were 628 acres of bomb damage—almost as large an area as the City of London. Along Unter den Linden many great buildings lay in ruins. To the west, Charlottenburg was a scene of devastation; so was the neighbouring Wedding district. The Lehrter and Potsdamer Stations had been gutted. The factories that had been wrecked ran into hundreds. In less than a month a great and splendid city had been so battered and broken that many parts of it were no longer recognizable.

The Second Stage

The second stage of the Battle of Berlin began in the early hours of Christmas Eve. Our bombers arrived at 4 a.m. on 24th December and added to the devastation in the central area; great fires raged in the Pariserplatz, the Leipzigerplatz and the Alexanderplatz; Neukolln to the south-east and Lichtenberg to the east were scorched too. As the heavies left, Mosquitoes arrived to hamper the firemen's work. For many Berliners that Christmastide was a season not for jollification but for fighting still-unquenched fires and sweeping up broken glass and plaster. Nor did their troubles pass with the festival. Our bombers came again on the night of 29th December and dropped more than 2,000 tons of bombs on the city; and they returned on the nights of 1st and 2nd January, 1944, when the attacks were not so massive but still made their contribution to the wrecking of the capital. In the raid of 2nd January they knocked out most of what had been left of Hitler's Chancellery in the Wilhelmstrasse by the November raids.

The largest force of Lancasters and Halifaxes yet sent to Berlin bombed it heavily on the night of 20th January, 1944, when 2,300 tons of bombs were dropped in a half-hour attack. A week later (27th January) the Lancasters came again and dropped 1,500 tons in twenty minutes through thick cloud. The suburbs of Erkner; Köpenitz, Treptow and Lichtenberg and the other great industrial districts, to the west, of Moabit, Siemensstadt, Charlottenburg and Spandau were the catchment area for the deluge of explosives and incendiaries. On the next night (28th January) the Lancasters came again, with Halifaxes to keep them company, and pounded central Berlin and the southern suburbs. A neutral report stated that "the factory belt was a heap of rubble" after this attack. It was the thirteenth raid since the Battle of Berlin began on 18th November.

Still greater destruction was caused two nights later (30th January) by a raid which the *Völkischer Beobachter* described as "one of the severest terror attacks Berlin has sustained." "British machines," the paper said, "caused damage crying to high heaven." The Tempelhof and Schöneburg districts and Charlottenburg were the worst sufferers. "The giant city of Berlin is dying, slowly and painfully, amid scenes of indescribable destruction," said a Berlin message to the *Morgen Tidningen* of Stockholm on 1st February.

Bomber Command's Final Blows

The next blow fell on the night of 15th February, 1944, and it was the heaviest yet struck.

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More than 2,500 tons of bombs fell on the city that night, "a heavier load," said the *communiqué*, "than in any previous attack on any objective in air warfare." The Tiergarten and the western districts and Schöneburg to the south caught most of the load, but the unhappy Unter den Linden got its quota too. The Stadtbahn and other railways of the city were paralysed. Travellers from South Germany had to detrain at Leuchenwalde, nearly forty miles out, and to proceed by bus and, in the final stage, by foot. Road traffic was reduced to chaos. Terribly cold weather added to the miseries of the inhabitants.

Berlin had only one more major attack by our heavy bombers after that red night in mid-February. They came again on the night of 24th March, and again dropped a load of over 2,500 tons of bombs. It was a costly raid for us; seventy-three bombers were missing, but they and their fellows did what they set out to do. They traced a furrow of destruction across the city, along the Ostwestachse, the east-to-west axis; a long line of craters between miles of ruins marked where they had passed. The Charlottenburg Chaussee, running through the Tiergarten, was ploughed with bombs, and Unter den Linden, unlucky to the last, did not escape.

The Industrial Effects

That was the end of the Battle of Berlin so far as it was a battle waged with intensity by Bomber Command; the Command's Mosquitoes continued, as is stated later, to harry the city in the year that followed, and the Lancasters which attacked the railway stations in Potsdam on the night of 14th April, 1945, had some bombs to spare for Berlin itself. But Bomber Command's great assault was over. It had lasted for a little more than four months. It left Berlin a desolation. The utmost capital was made, naturally, by the German propaganda service of the damage done to non-military property, and the news received through neutral channels dealt largely with such damage, which was more sensational than that relating to industrial damage. It was only after hostilities ended that precise information could be obtained of the effect of the four months' raids on war production. The raids, it was made clear, were far from being the mere *Terrorangriffe* which the Germans denounced with such persistence. They had definitely military results, some of which were disclosed by the Air Ministry in a Bulletin issued on 9th July, 1945.

This showed that the great Siemens and Halske combine, which employed 30,000 hands and had seven large factories in the Berlin area, mainly in Siemensstadt, never recovered from the damage done in the attacks of November, 1943, to March, 1944. The combine produced radio components, telephone apparatus, amplifiers, valves and other electrical equipment; the output was reduced by 30 to 35 per cent. as a result of the raids. The falling off of production by the factories of another concern, Siemens-Schückert, was slightly greater. The Rheinmetall Borsig plant situated on the eastern side of Berlin was destroyed to the extent of 50 per cent. of capacity in a single raid, that of the night of 26th November, 1943. It, too, never succeeded in attaining its pre-raid output. An interesting discovery was that in that raid only one worker was killed, no doubt as a result of the strict rule that when an alert sounded the workers should go to the shelters: a rule which served to save life but to depress the graph of production.

The Americans Take Over

When our heavy-weights dropped out of the torch race to Berlin the American heavies took their place. Indeed, they had started already before we fell out. The Flying Fortresses and Liberators of the 8th United States Army Air Force, with their usual fighter cover, made their first attack on targets in the Berlin area on 6th March, 1944; they hit hard at the Zehlendorf district, about eight miles south-west of the centre of the city. It was a costly raid; sixty-eight bombers and eleven fighters were missing, and among those lost was Brigadier-General Russell Wilson, who led the sortie in a Fortress. But the enemy fighters had heavy losses too; 176 of them were stated to have been brought down.

The Americans made another attack on 9th March, bombing by instrument through heavy overcast; according to the German reports they caused severe damage to residential districts. The attack, said the German radio, was carried out with "typical American ruthlessness." They came again on the morning of 22nd March, using, it was stated, "the new cloud-bombing methods." This raid seems to have been less destructive than the next, on 29th April, when heavy damage was caused in Schöneberg, Tempelhof and other southern suburbs. This raid also cost nearly seventy American bombers and fighters; eighty-eight enemy aircraft were claimed to have been destroyed.

How grievously the British and American raids had by this time affected the appearance and the amenities of Berlin was made clear not only in messages from neutral observers but also in admissions by German commentators. A

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forces' broadcast on the Berlin radio on 1st May, 1944, stated:

"During the first three years of the war the German soldier on leave came to Berlin with the intention of enjoying the splendour of his home town, its guarded life and comfort. Today the soldier is reminded of a front-line town devastated by the fury of war" (quoted in *The Times*, 1st May, 1944).

The city's ordeal was not ended yet. Great forces of Flying Fortresses and Liberators came to pound it again on four days in May and one in June. The factories, railway stations and Government buildings were the aiming points, but all the central area was plastered with bombs and few parts of the city escaped fresh damage. In the raid of 21st June four of the great stations—the Potsdamer, Anhalter, Friedrichstrasse and Schlesischer—were hit, as well as the Tempelhof marshalling yards to the south and many industrial plants. Railway stations and yards were again the chief objectives in the next American raid, which followed the June attack after an intermission of more than seven months.

American Raids in 1945

It came on 3rd February, 1945, and was the most damaging blow which the 8th United States Army Air Force had as yet struck at Berlin. More than 1,000 Flying Fortresses, escorted by 900 fighters, hit the heart of the city and left a mile and a half square of devastation behind them. The death roll was high; it was swelled by the presence of thousands of refugees from areas which seemed to be in danger of being overrun in the Allied armies' advances.

There was a heavier raid still three weeks later. On 26th February 1,200 Flying Fortresses and Liberators, with 700 fighters, sent down the greatest bomb load yet dropped on the city: 3,000 tons, as compared with 2,500 tons on 3rd February. The whole district around the main objectives—the Schlesischer and Alexanderplatz passenger stations and the northern goods station—were blown to pieces by the hurricane of bombs. Again the death roll was tragically high. That was the price the wretched German people had to pay for Hitler's mad resolve to fight to the twelfth hour and beyond it.

There were three American raids on Berlin in March, on the 15th, 18th and 24th. That of 18th March was the heaviest daylight attack of the war; 1,300 Flying Fortresses and Liberators, escorted by 700 Mustangs, dropped 3,000 tons of bombs, including the huge total of 650,000 incendiaries, on the Schlesischer railway yards, the Rheinmetall Borsig works and a tank factory some miles outside the city. The raid of 24th March was one carried out by the 15th United States Army Air Force from Italy; its objective was the Daimler Benz tank works. It was the longest escorted raid of the war.

The Mosquito Raids

During the last year of the war, it will be seen, all the large-scale bombing of Berlin was done by the American Army Air Forces in England and Italy. Bomber Command played its part, too, although only a minor one, in the harrying of the city. Its Mosquitoes were used for this purpose. These small wooden machines were capable of carrying a 4,000-lb. bomb and their forays were of much more than nuisance value. They could operate at such a height that they were practically immune from flak attack, and their speed was such that they could evade the night fighters. They could not hope, of course, to cause material damage comparable to that done by the heavy bombers, but they were able to supplement the latter's attacks by keeping the active and passive defence services in a state of tension and by forcing workers to take shelter on their approach, thus interrupting production. They had remarkably few losses themselves.

The Desolate City

By the time hostilities ceased approximately one-third of the built-up area of Berlin had been destroyed: a percentage of destruction which meant very much more than its face value in a city of such size. The devastation was especially apparent in the central part. That was why the magnitude of the city's disaster made so great an impression on all the correspondents, British and American, who entered it after its capture. Joseph Grigg cabled from Berlin to the *Evening Standard* of 10th May, 1945:

"Berlin is dead. It has been wiped off the map. As a city Berlin no longer exists. I was one of the first group of Allied correspondents officially permitted by the Russians to enter the city after its fall on 2nd May. I used to work in Berlin at an office in the Unter den Linden. Today I had the utmost difficulty in identifying the site where that office used to stand. The extent of the catastrophe that has overtaken Berlin is difficult for the mind to grasp. It is not merely a street here and there or even a whole block of buildings wiped out. The whole city has been practically obliterated. From the fashionable Kurfuerstendamm in the west to the Alexanderplatz and the Frankfurter Allee in the east—a distance of about four and a half miles—and the same distance from north to south, the city is an

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eerie echoing waste of ruins and bomb craters, with the burned-out skeletons of tall buildings."

The special correspondent of *The Times* described in an article with the heading "Dead Heart of Berlin" in that paper on 13th June, 1945, what he had seen in the city:

"An area as extensive as the London that lies between Primrose Hill and the River Thames and from Knightsbridge to the Bank of England is dead, written off, abandoned—a sight so terrible as to numb all feeling. Embassies, banks, huge department stores, hotels, churches, Government buildings and imperial monuments are just shells or hillocks of rubble. You can walk for hours and see no small thing, not a stick of furniture, a rag or a scrap of paper to suggest that there was ever any life here. Fire has consumed all."

Some months later Sir Ronald Storrs saw Berlin during a lecture tour undertaken by him for the Admiralty and the Rhine Army, and gave his impressions of the city in the *Sunday Times* of 9th December, 1945. He wrote:

"In that city, mile after mile, before and behind, to right and to left, so far as the eye can reach and much farther, stretch alternate skeletons and shells of huge buildings and flat deserts, tragic indeed but sordid, and utterly without the dignity of a Roman ruin, or the wistful beauty of the Greek. No patination of time could ever make of these a Fountains Abbey or a Coventry Cathedral, nor mitigate in the least their imperious large-scale vulgarity."

Si monumentum requiris, circumspice. Nazidom had promised the deluded people of Germany a new heaven and a new earth, and this was what it actually gave them. During our generation at least the ruins of Berlin will stand as a reminder of the twelve years of Nazi rule and of their disastrous ending. No doubt the city will rise again, but time can never efface the memory of the catastrophe which overtook it in those tragic years of the Second German World War.

The measure and the significance of the catastrophe were well expressed in an article which Sir Harold Butler contributed in *The Spectator* of 6th December, 1946. He wrote:

"Over all the squalor and ruin broods the gibbering ghost of the old Germania, mourning the departed glories of the Fatherland, nothing left now except dust and ashes. Nearly the whole city is a gutted shell. . . . The capital of the Hohenzollerns and of Hitler no longer exists. They led their fanatical foolish subjects to irreparable catastrophe, of which Berlin is the epitome. Under its grisly remains lie the power, wealth and arrogance of three Reichs buried in a pauper's grave."

And the same story can be told of fifty other ruined German towns.

III.—THE CITIES OF JAPAN

The First Phase

The cities of Japan began to learn what air power meant only when the United States Army Air Force had established itself in the Marianas, due east of the Philippines, and acquired there the bases from which it could strike heavily at targets in Japan. Previously there had been raids on the main Japanese islands by Super-Fortresses based in China and by carrier-borne aircraft. They had not been very effective. Raids by ship-borne aircraft had been expected by the Japanese and discounted in advance. In a book first published in 1940 a Japanese writer had predicted confidently that such attacks were alone to be expected and that they would do little damage (Kinoaki Matsuo, *How Japan Plans to Win*, English translation by K. K. Haan, 1942, pp. 203 and 205). The second part of the forecast was not far wrong; the first was belied by subsequent events.

It was in November, 1944, four months after the seizure of the islands, that the first long-range bomber bases in the Marianas became operational. During the winter bombers based in the Marianas delivered a number of attacks on objectives in the Japanese islands, concentrating especially on aircraft and aero-engine targets. The bombing was carried out at a height of 30,000 feet and the percentage of hits on the aiming points was low, but enough damage was done to the engine plants to force the Japanese to disperse them, at the cost of production. This first phase of the strategic offensive was, however, a mere curtain-raiser for the grim drama that was to follow. During it only a little more than 7,000 tons of bombs were dropped on Japan; during the second phase, from March to the end of July, 1945, some 150,000 tons were dropped.

The Second Phase

The second phase began on 9th March, 1945. That was the dividing line in the air offensive. A new strategic policy was put into force then. Previously the assumption had been that the invasion of Japan by ground forces would be necessary to enforce her capitulation, and the objectives selected for attack were of such a nature that destruction of them might be ex-

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pected to weaken the enemy's power to resist the invasion. For this reason the targets attacked were aircraft factories, arsenals, electrical plants, oil refineries and military supplies. The new policy was based on the idea that, while the object of weakening Japan's power to resist invasion should still be pursued, the alternative possibility of her being forced to surrender without the need for invasion could also be envisaged. For the latter purpose it would be necessary to wreck the basic economic and social fabric of the country. "Disruption of her railroad and transportation systems by daylight attacks, coupled with destruction of her cities by night and bad-weather attacks, would have applied maximum pressure in support of either aim. This point of view was finally adopted. Although urban area attacks were initiated in force in March, 1945, the railroad attack was just getting under way when the war ended." (United States Strategic Bombing Survey, *Summary Report* (*Pacific War*), 1st July, 1946, page 16.)

The Cities Attacked

The first attack under the new programme was made on Tokyo and was followed by a number of other saturation raids on populated centres. It is curious that whereas in Europe there was a tendency in the last stage of the war to switch from target area bombing to precision attack on specific objectives such as oil plants and railway junctions, an opposite tendency was to be seen in the Far East. In that theatre specific objectives were still to be bombed by day under the revised programme, but in addition target areas were to be attacked by night. Justification of the new policy was at once forthcoming. On the night of 9th March, 1945, Tokyo was attacked from the low height of 7,000 feet and incendiaries alone, of a total weight of 1,667 tons, were dropped. The effect was absolutely shattering. Fifteen square miles of Tokyo's most densely populated area were burnt to the ground, and the casualties numbered 185,000, including 83,000 dead. It was the most destructive attack ever made from the air, the attacks on Hiroshima and Nagasaki with atomic bombs not excluded.

The raid of 9th March was followed by others during the succeeding ten days on Nagoya, Osaka and Kobe. Two square miles of Nagoya were destroyed on 11th March and eight square miles of Osaka on 13th March. Altogether, thirty-one square miles were devastated during the ten days. The cost of this tremendous assault was extraordinarily low—only twenty-two American aircraft, a figure which showed up the weakness of the Japanese defences in the air and on the ground. The new policy of night raiding was thus fully demonstrated.

After these attacks on the four largest cities in Japan a number of other towns were bombed and selected industrial targets were also attacked. In all, sixty-six urban areas were raided and some 40 per cent. of their built-up areas was destroyed for an expenditure of 104,000 tons of bombs. The worst sufferer was Tokyo. By the end of May fifty-one square miles of that city had been gutted. Admiral Suzuki, the Premier, stated in a broadcast to the Japanese people on 27th May that the city had been destroyed beyond any hope of repair and would have to be rebuilt.

Confirmation of that description was forthcoming when Tokyo was occupied after the Japanese surrender. Press correspondents described it as "a vast expanse of ruins," "a complete shambles," "a fantastic symbol of rubble and dust, death and desolation." "The damage done in Tokyo by incendiary and high-explosive bombs is terrible," they reported. "In Yokohama the damage is not so great, being confined to railyards, industrial centres and docks, while most of Tokyo has been destroyed" (*The Times*, 1st September, 1945, quoting Australian correspondents who had visited Tokyo and Yokohama).

Nagoya and Yokohama, as well as Tokyo, were heavily raided in April and May, and in June and July there were some further attacks on Osaka and Nagoya, but the main assault in these months was directed against the secondary cities in Kyushu and Honshu. It was carried northwards also into Hokkaido, the chief town of which—Hakodate—was raided by carrier-borne aircraft on 14th and 15th July. The air offensive was supplemented effectively by naval bombardment. Admiral Nimitz's warships shelled the iron centre of Kamaichi in Honshu on 14th July and the steel centre at Muroran on Volcano Bay in Hokkaido on 15th July.

Attacks on Specific Targets

In addition to the attacks on urban areas, there were others, not of the blanket kind, on selected targets, industrial and military, particularly aircraft factories and oil refineries. The plants of the three great aircraft constructing firms, the Kawinishi, Mitsubishi and Nakajimi combines, were heavily raided, as well as air stations and aerodromes. The destruction of the Mitsubishi plants at Nagoya was the high-light of the campaign against the aircraft factories. The effect of this and the other attacks was to reduce pre-attack productive capacity by 60 per cent. in the case of airframe plants and 75 per cent. in that of aero-engine plants. The campaign against oil was

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more successful still. The pre-attack productive capacity of Japan's refineries was reduced by 83 per cent. Japan had not developed a synthetic-oil industry and depended for her liquid fuel on her refineries, the most important of which were situated at Kawasaki on Tokyo Bay. Many of the refineries had had to cease operations for lack of the crude oil which they needed; those that remained were put out of action by air attack.

Oil imports into Japan were completely cut off after the Philippines had been recaptured. The Japanese merchant fleet was driven from the sea. It had been a fleet of six million tons at the beginning of the war and had been increased by four millions thereafter. Nearly nine million tons of this shipping were sunk or so seriously damaged as to be out of service at the end of the war. About 40 per cent. of this catastrophic loss was due to air action, including mining by Super-Fortresses; nearly 55 per cent. was due to submarine attack and only 1 per cent. to gunfire by surface warships; the balance of 4 per cent. was attributable to marine accidents (*Summary Report* (*Pacific War*), 1946, page 11).

The Effect of the Bombing

The strategic air offensive yielded quicker results in Japan than in Germany. In July, 1944, after four years of the offensive and eighteen months of severe bombing, German production was higher than it had ever been. In July, 1945, after eight months of bombing and less than five of severe attacks, Japanese production was critically cut. "A Survey investigation of production in plants employing more than fifty employees in thirty-nine representative cities of Japan," says the *Summary Report* (*Pacific War*), "indicates that production in those plants which suffered direct physical damage dropped off by July, 1945, to 27 per cent. of peak output in 1944, while production in the undamaged plants fell off to 54 per cent." The decline was not entirely due to air attack. A proportion of it was attributable to other causes, such as malnutrition, fatigue, absenteeism, shortage of raw materials, etc. It is evident, however, that the main reason for the decline was the air offensive. It accounted, says the Survey, for about 20 per cent. of the 40 per cent. by which overall production efficiency had deteriorated by July, 1945, as compared with the 1944 peak. The fall in certain industries, such as oil refining and aircraft and electrical equipment production, was far steeper than the general decline.

Japan's economic position was hopeless when, on 26th July, the three Powers represented at the Potsdam Conference issued their ultimatum, calling upon her to surrender or to face the alternative of "complete and utter destruction." On 27th July aircraft of the 20th United States Army Air Force dropped millions of leaflets warning eleven Japanese cities that they were next on the list to be bombed. The threat was no idle one, as the cities soon learned. A similar warning was issued on 31st July to twelve further cities. In addition, three million leaflets containing the Potsdam ultimatum were dropped on fifty Japanese towns at the beginning of August.

The Atomic Bomb

What that ultimatum had really portended was disclosed dramatically on 6th August to a half-unbelieving world. On the night of 5th August powerful forces of Super-Fortresses had dropped 4,000 tons of bombs on five towns in Japan. At noon on 6th August a single Super-Fortress dropped on Hiroshima a single bomb which surpassed them all in destructive effect. The atomic bomb had come crashing into history. A second atomic bomb was dropped on Nagasaki three days later. On 10th August Japan offered to surrender. The offer was not sufficiently unconditional and the attack went on, with chemical bombs, not atomic. The heaviest attack of the saturation kind yet made (according to General MacArthur's *communiqué*) was launched on 10th August against the major supply centre of Kumamoto. A further jog was given to Japanese indecision when aircraft of the American and British fleets bombarded military targets in the Tokyo area at dawn on 13th August. On 14th August Japan surrendered unconditionally.

Earlier in this article it has been shown that her surrender was not caused by the bombing of Hiroshima and Nagasaki, though the bombing of these cities was the occasion for it and probably accelerated an event already inevitable. No other conclusion is possible from the facts as given by the United States Strategic Bombing Survey in the *Summary Report* (*Pacific War*) and in greater detail in the report entitled *The Effects of the Atomic Bombs at Hiroshima and Nagasaki*. Besides the American Mission, another from the United Kingdom visited Japan in 1945 to investigate the effect of the atomic bombing and its report was published by His Majesty's Stationery Office in the summer of 1946 under a similar title to the second of the American reports. It covers largely the same ground as and is in general agreement with the American report. The two reports prove conclusively that Japan was already a defeated nation before August, 1945. That, indeed, was fairly generally understood before the missions re-

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ported. Japan, said *The Times* in a leading article on 9th October, 1945, was "utterly and hopelessly beaten before the first [atom] bomb fell." All that the bombs did was to make politically possible a surrender which had become militarily imperative some months before.

Atomic and Chemical Bombing

The reports bring out clearly the very high degree of effectiveness of the atomic as compared with the ordinary bomb. The British experts illustrate the difference in this way:

"The scale of destruction expected [from an atomic bomb] would be that which would befall a model town built on the scale of Gulliver's Lilliput, one inch to the foot, if there were exploded above it a bomb more than twice as large as the largest British 'blockbuster,' which with its case weighed about six tons."

The American report states that the area of effectiveness of an atomic bomb is 225 times as great as that of a ten-ton "blockbluster."

For several reasons the effect of the bombs dropped on Hiroshima and Nagasaki was greater than that which it would have been in Western cities. Most of the buildings in the two towns were bamboo-walled houses, the usual dwellings in Japan. Such reinforced-concrete buildings as there were stood up to the impact fairly well. In the centre of Hiroshima, the American mission state, about fifty buildings remained standing, and all were of reinforced concrete. Unframed brick buildings, with load-bearing walls, which make up the bulk of European housing, are rare, the British report states, in Japan, but from such isolated examples of this kind of construction as the mission saw it seemed that the effect of an atomic bomb would be to destroy or damage beyond repair all houses within a distance of one mile from the centre of damage, and to make temporarily uninhabitable houses within two and a half miles. "The overwhelming bulk of the buildings in American cities," says the American report, "could not stand up against an atomic bomb bursting a mile or a mile and a half from them."

Air-raid Precautions in Japan

Within that radius, however, the casualties in a Western town would not necessarily be on the same scale as at Hiroshima and Nagasaki. The passive defence in both cities was inadequately organized beforehand and went to pieces when the bombs were exploded. "There was almost no attempt to rescue those who were trapped or hemmed in by debris while points of fire sprang up round them," states the British report. Very many people were burnt to death. The provision of air-raid shelters in Japan was much below European standards. The report adds:

"The standard British shelters would have performed well against a bomb of the same power exploded at such a height. Anderson shelters, properly erected and covered, would have given protection. Brick or concrete surface shelters with adequate reinforcement would have remained safe from collapse. The Morrison shelter is designed only to protect its occupants from the debris load of a house, and this it would have done. Deep shelters such as the refuge provided by the London Underground would have given complete protection."

The American report states:

"The most instructive fact at Nagasaki was the survival, even when near ground zero [*i.e.*, the point on the ground directly beneath the point of detonation], of the few hundred people who were properly placed in the tunnel shelters. Carefully built shelters, though unoccupied, stood up well in both cities."

The tunnel shelters referred to were dug horizontally into the sides of hills with crude, earth-filled blast walls protecting the entrances. The blast walls were blown in, but those of the 400 occupants who were not in a direct line with the entrances survived, even in the tunnels almost directly under the explosion. The tunnels had a capacity of roughly 100,000 persons and the American mission considered that if the proper alarm had been sounded the loss of life in Nagasaki would have been substantially lower. Given adequate shelters, the same report adds, the occupants would be protected from the effects of gamma radiation (as to this, see below).

Japanese Buildings

In considering the effects of both atomic and ordinary bombing in Japan one has to bear in mind that the cities there, being mostly of very gimcrack construction, are particularly vulnerable and make the ideal fuel for fire. Mr. John Morris, a former resident in Japan, gave in the *Fortnightly* for November, 1946, an account of a six-month visit which he had recently paid to that country, and in it he drew attention to the fact that the average Japanese city consists of a small core of modern steel and concrete buildings, while 90 per cent. of the houses, shops and even factories are made of wood. He wrote:

"In Tokyo (and with the one exception of Kyoto, which was never bombed, the same applies to every major town in Japan) the middle part of the city, which centres round the Imperial Palace, is battered but more or less as it was before the war. A building here

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and there has been gutted, but the general effect is rather like the less badly bombed parts of London. . . . Outside this area the picture changes completely. The rest of Tokyo has practically disappeared; it was burnt to ashes in three big raids last year. The destruction in Tokyo is on almost a Carthaginian scale. . . . The names of the various districts are of course still the same, but little remains by which to recognize them."

The Casualties

It is a fair assumption that the casualties caused by atomic bombing in Western countries would not be as high as they were at Hiroshima and Nagasaki, or at Tokyo, where they were higher still. The death roll is estimated at 70,000 to 80,000 for Hiroshima in one of the two American reports, and at 60,000 to 70,000 in the other, while the British estimate is 70,000 to 90,000. At Nagasaki the American reports give estimates of 35,000 and 40,000; the British estimate is "about 37,000." The injured appear to have numbered about 50,000 at Hiroshima and 40,000 at Nagasaki. Substantially lower figures for the fatal casualties were given in a report to the Japanese Diet on 6th September, 1945: 49,221 killed at Hiroshima and 21,501 at Nagasaki, the injured being 58,839 and 51,581 respectively. Mr. John Hersey (*Hiroshima*, 1946) states that statistical workers at Hiroshima reported 78,150 people killed, 13,983 missing and 37,425 injured, but he adds: "No one in the city government pretended that these figures were accurate." It is doubtful, in fact, whether any close estimate was possible in the circumstances.

The new menace to the cities which atomic warfare portends lies not so much in the greater number of the casualties which it may cause but in the different nature of the casualties. It is this which sets it apart and condemns it. The official reports on the bombing of Hiroshima and Nagasaki leave no possibility of doubt about the hideous character of the injury which atomic bombs inflict on human organisms.

The Banning of Atomic Weapons

The case for the prohibition of atomic weapons needs no demonstration beyond that afforded by the facts recited above. If gas and bacteriological warfare is repugnant to humanitarian sentiment, so, surely, is atomic warfare. It should equally be banned. That, indeed, is now generally admitted. The only difference of opinion relates to the way in which the ban should be made effective. There ought to be no insuperable difficulty in reaching agreement upon this point. Yes, it may be said, but would not any ban be disregarded if war did break out? Here the writer makes bold to suggest that the pessimistic views sometimes expressed upon this subject are by no means incontrovertible. He remembers how the suggestion which he and others hazarded after the First World War that gas would not be used in the next was scoffed at by all the hard-bitten realists in chorus. Of course gas will be used, they said. Well, it was not used. Atomic warfare is not entirely parallel to gas warfare, but the chief reason why the latter did not make its threatened appearance in 1939-45, namely, fear of the consequences of a first resort to it, will apply in still stronger measure to atomic warfare. Prophecy is always dangerous, but the writer here goes on record as stating his view that we have seen the first and the last of the atomic bomb.

If it disappears it will have few mourners. It is much better dead. Who on earth wants to keep it? Certainly not our Air Force, so far as the writer can judge. Would the men of any air force wish to see it survive? Would any professional fighting man, for that matter? No chivalrous airman, soldier or sailor is likely to favour a weapon the use of which dooms men to a vomiting, lingering death, which causes abortion in pregnant women, which offends against every feeling of humanity to an even greater degree than does poison gas or plague warfare. Indeed, the writer knows that a number of distinguished Service people hold, with him, that it would have been a thousand times better if this horrible weapon had never been used. One wonders, in fact, whether the use of it in 1945 was agreed to by the Combined Chiefs of Staff at Washington, and what the British Chiefs of Staff in London thought of the idea. One suspects that the decision to use it was a political one, taken over their heads; but that we shall not know until the inner history of the time comes to be written.

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"The First of the Many"

An account of the early days of the W.A.A.F.

By

SECTION OFFICER H. L. MAITLAND

WITH ILLUSTRATIONS BY HELEN McKIE

"MARKER FALL IN"

IT all began for me that day in September, 1938, when Mr. Chamberlain returned from Munich with the assurance that there would be no war.

I had been so completely shaken by the thought of war, with the terrors of air raids (an experience in the Spanish War being still fresh in my memory) that although I, along with millions more, was greatly relieved to learn that it was going to be "peace in our time," I was convinced in my humble way that to ensure there would never be any scares of war in the future, the British Empire must be so strong that no other country would threaten our peace.

I was, therefore, somewhat relieved to learn that the Government obviously held the same views as myself when the National Service booklet came into my possession somewhere round about Christmas, 1938! I read it through carefully. There was a great variety of jobs one could do. Women could be enrolled for service with the Royal Air Force. I thought this was just the thing for me. I had always been keen on aeroplanes and flying and the thought of being part

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of this Service simply thrilled me. I wrote to Air Ministry. When, after a lapse of two weeks, I had received no reply, I impatiently wrote again. I received a very polite note requesting me to make enquiries at the local A.T.S. Headquarters. Thinking this was some wile to get me to join the Army instead of the Air Force, I ignored the instructions and again wrote to Air Ministry pointing out that it was the *Air Force* I was interested in. There was further correspondence. Then, one day, success at last! I received a postcard asking me to report to an address in Coplaw Street, Glasgow, on a certain Friday evening in June, 1939. That was the beginning.

I duly arrived at Coplaw Street. I discovered it was the City Headquarters of the 602 City of Glasgow Auxiliary Squadron which, as 602 Fighter Squadron, was to add so much glory to the City in the Battle of Britain. Clutching my postcard, I glanced at it again to make sure I had arrived on the correct date. I looked at my watch. I was five minutes ahead of time. I entered the doorway.

The door opened into a hall. It was a huge, barren-looking place which I might have compared to the inside of a hangar had I known what the inside of a hangar looked like in those days. At the far end was a full-scale model of a plane. Round the walls were various photographs of the Auxiliary Squadron. On the right-hand side, some girls were standing around in a group. A welcoming smile drew me towards them and we were soon all on very friendly terms. They all seemed to be particularly good looking, and one of them, whom everyone called Kathleen, seemed to have all the information. Kathleen was engaged to a pilot in the Squadron, knew why we had all been called, and was already something of a heroine. She told us we were the nucleus of the Women's Air Force, we would be an officer-producing unit, were to be known as "cadets" and we could serve as transport drivers or clerks. Some more girls, if anything even more good looking, arrived, and Kathleen was again the centre of attraction. Whilst this latest "briefing" was being carried out, from out of a side door breezed a large woman, laden with sheaves of papers and livening up the atmosphere like an electric current. She beckoned to us to be seated and proceeded to address us. She informed us that she had been in the Air Force in the last war and enthralled us with some of her experiences. Here was someone who had already experienced service in this wonderful Air Force. I was spellbound. She said we would be known as No. 4 City of Glasgow Company. She described the uniform we should wear. Air Force blue tunic and skirt, grey stockings, black shoes, blue shirt, black tie and blue cap with a black peak. Whilst making a mental picture of myself in this attractive sounding garb, I glanced at the potential wearers on my left and right and thought how well this uniform would suit them. Kathleen, Maisie and Jocelyn, with their lovely figures, and Kirsteen and Anna with their lovely fair hair and blue eyes. Little did I realize that so much would happen before I should see myself or anyone else so attired.

Thereafter, No. 4 City of Glasgow Company met each Friday evening at Coplaw Street where for two hours we were drilled by an R.A.F. Sergeant. He was wonderfully patient with us. Again and again he commanded, "Marker fall in," when the tallest of our number would, as prearranged, detach herself from us (all huddled together like hens on a wet day) and walk—one could hardly call it marching—across the floor to take up her position as indicated by the Sergeant. Then the command, "Company—on parade," was the sign for a general stampede. We would all rush on to the floor, re-shuffling ourselves until we found ourselves beside our particular friend, irrespective of height, and finish up in a line resembling the curves of a scenic railway. By a series of manœuvres—we hardly knew how—we would appear in two lines, and then we spent tedious hours forming fours, to the command, "One, onetwo." Then adjournment for tea, dispensed by the Sergeant's good lady wife, when we would discuss the trade we had chosen. The choice was very limited. As Kathleen had informed us, there were Clerks and Motor Transport Drivers, and also Mess and Kitchen Staff. Those with no clerical knowledge or driving experience automatically became Mess and Kitchen Staff. What the latter implied few of us had the faintest idea. During those weeks before 3rd September none of us was called upon to carry out any of the duties for which we had volunteered. All our time was taken up in physical training and the never-ending "One, onetwo." When we had mastered the latter to the Sergeant's apparent satisfaction, we set off on a route march round the hall. Wheeling at the corners, some of us got out of alignment, but we always managed to catch up again on the straight, and so it went on until the Sergeant's peremptory "Halt" generally startled us so much that we all crashed into each other and came to a stop in a confused mass. Gradually, however, we were quickly able to distinguish "right" from "left," and "One, onetwo" no longer found us in a state of confusion.

When on 2nd September we were mobilized we felt we were fully equipped to take up our place with the men of the Royal Air Force. We

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"UMBRELLAS WERE ADDED TO THE KIT"

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lived at home and travelled to Coplaw Street each day. Recruits came pouring in. Those of us with clerical knowledge were installed in what was known as the "Orderly Room," a room on the ground floor stacked with all sorts of interesting-looking volumes, files and papers. This room proved the centre of activities for many days after the Declaration of War, and we rarely ceased work before 8 o'clock in the evening.

We acquired maroon and blue Air Force ties which we wore with our civilian suits. Armbands of brown tape, with "No. 4 W.A.A.F." crudely marked in blue chalk, were worn on the right arm. We were immensely proud of our armband. The new recruits who came daily pouring in had to be taught the intricacies of "One, onetwo," and each of us, in turn, endeavoured to emulate our Sergeant who, by this time, had been called to more important duties.

On Sunday, 10th September, we had our first Church Parade. There were about forty of us on parade. We were dressed in every conceivable style and colour. Several wore long pendant earrings. Some carried handbags, and as the rain came on just as we were about to leave, umbrellas were added to the "kit." We were marched off by a young officer, the other officers deciding to go by car in case they should ruin their new uniform. The rain was coming down in torrents and before long we were simply soaked. Some Glasgow children who, in spite of the rain, stopped to watch us go past, shouted, "Hey, Missis, are you the Land Army?"—much to our disgust, especially as we were wearing our distinguishing armbands which we imagined clearly indicated our status. With everything but our enthusiasm damped, we entered the church and occupied the front pews. There was an air of solemnity over the whole congregation. The service was most touching, and to add to the general atmosphere we were uncomfortably wet. A chill feeling kept running up and down my spine. Only when the Minister put up a prayer for the "men and women of His Majesty's Forces" did I realize that I was one of these women. Then the organ slowly burst into "The King," and we smartly stood to attention. A lump came into my throat and a warm glow seemed to surge through my veins. For the moment, gone were the terrors of air raids and the many unreal terrors which my morbid imagination had conjured up in those Munich days, and it was with a feeling of pride and patriotism that I marched from the church.

As we stepped outside, the rain had ceased and a watery sun was struggling through a few broken clouds. Our senior officer, now less fearful for her uniform, decided to lead the triumphal march from the church. Watched by interested spectators, we got ourselves into line and set off. The officer (the "large woman" who had so impressed me at her first lecture) sailed along in front of us as proud as a mother hen with her brood of chicks. For quite ten minutes we marched steadily on, left, right, left, right, all swinging our arms and looking straight ahead, when suddenly a voiced boomed over our heads, "Company—eyes right." Thankful that we knew what to do, as we were very conscious of many civilian eyes on us as they lined the road on our left, we smartly turned our head and eyes to the right. There was no one there! Without moving my head, I turned my eyes to the left and there, almost groping along the pavement, was a very timid and self-conscious young Pilot Officer. He completely ignored us and accelerating his pace, shot past us. A quick "Eyes front" from our officer had the effect, at least, of bringing us all into line again, and we arrived back at our Headquarters without further incident.

The next few weeks were very busy ones for the No. 4 City of Glasgow Company. Those of us who could type were busy in the Orderly Room typing nominal rolls, casualty forms, and helping new recruits to complete their applications. Adjoining the Orderly Room was our Commandant's office. The only telephone was in the Orderly Room, with the result that each time she was wanted on the telephone she came crashing in on top of us. So strongly had she impressed on us the necessity of standing up in the presence of an officer, and so anxious were we to obey all instructions, that each time she dashed in to the telephone we in the Orderly Room jumped up to attention. So it went on about every few minutes, all of us bobbing up like a jack in the box. As can be well imagined, all this jumping up and down greatly interfered with our work, but not a word of complaint was heard. We all accepted it as one of the many little inconveniences that had to be put up with for the privilege of being in the Royal Air Force!

One day, still in the first month of the war, we were informed that we were to be inspected by Lord Inverclyde. We had by this time mastered the art of marching in step, except for poor "Peggy" who was unable to get her arms and feet to synchronize and shot her left arm forward with her left foot and her right arm with her right foot, almost completely disorganizing the whole file. Lord Inverclyde spoke a few words of encouragement to us, and when he ran his eye along our columns I thought I detected an amused twinkle. As we had only our armbands to distinguish us from civilians, we presented a rather unmilitary spectacle.

While the 602 City of Glasgow Squadron were

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"ALL THIS JUMPING UP & DOWN"

moving from the Clydeside to their new quarters in the East of Scotland, we were busy in their Town Headquarters at Coplaw Street. Our uniforms had arrived. They consisted of an Air Force blue raincoat, dark blue beret with R.A.F. badge, grey stockings, black shoes, blue shirt and black tie, but—alas, no skirt! Although some threatened to appear on parade with the complete kit *sans* skirt, no one had the courage to carry it out, and we supplied ourselves with the necessary garment. We completed this with brown leather gloves of the "cadet" type, as the original thirty of us were still rather snobbishly calling ourselves "cadets."

One morning towards the end of September there was great excitement. Up to this time we had no official number or rank. Our numbers had now come through from Records and some of us had been given N.C.O. rank. The ranks were: Senior Leader, Section Leader, Assistant

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Section Leader, the equivalent R.A.F. ranks being Flight Sergeant, Sergeant and Corporal, respectively. One rather older woman was to be Senior Leader. Sheah, Kathleen and I were to be Section Leaders, and there were three Assistant Section Leaders. We were all wildly excited and someone dashed off to purchase the necessary chevrons, which were referred to as "tapes." In the midst of my joy I suddenly noticed two little tear-stained faces in the corner. Anna and Kirsteen thought they had been overlooked in the promotions (actually they were considered to be too young) and were quite heartbroken! This somewhat damped my enthusiasm.

October, 1939, found our 602 City of Glasgow Squadron in action over the Firth of Forth area. "Kathleen's" fiancé was now in the front line and she again came into the limelight with thrilling accounts of the house-top fights between Spitfires and Heinkels. It was about this time that she announced she was going to be married. A number of us who were invited to the church agreed to form a guard of honour. It is strange how some scenes so firmly etch themselves on the mind. I can see the inside of that church now. The solemn, motionless congregation, the bride, stately and sweet in her white dress and veil, and the bridegroom, so young and good looking, in his Royal Air Force uniform, the Minister speaking of the dangers facing the young bridegroom as we prayed for his safe return, and for the

"THREATENED TO APPEAR ON PARADE SANS SKIRT"

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moment my emotions overcoming me as I silently wept.

The war was pursuing a steady course and contrary to our expectations there had as yet been no air raids on Glasgow. We were still busy with nominal rolls, casualty forms, etc. Drill, however, was still of primary importance and those of us who had been fortunate enough to get our "tapes," were occasionally required to take a squad on drill or route march. Round about this time we were informed that we were all to appear on the parade ground, which was the playground of a school nearby, as a Warrant Officer from Abbotsinch was going to teach us the new drill formation. After all the tedious hours of "One, onetwo," a most inconsiderate Air Ministry had decided to change the marching formation from four columns to three. It was very trying. Here we were almost back where we began. We paraded as instructed. We expected a nice kindly man like our Sergeant Instructor, but to our horror we found a man with a face and neck like a bulldog and with a voice that was even more terrifying. With all due respect to him, he had a formidable task, to knock out of our heads this "One, onetwo" which we had mastered so expertly, and to replace it with this strangely complicated and most unwelcome new formation! With his first word of command one girl fainted and had to be carried off. With his next command two more collapsed, and by this time there was a mild feeling of hysteria. He did not spare us for a moment. He was treating us "tough." He left-turned us, right-turned us, marched us up and down and round about. He then made us run at the double. This saved me from joining the casualties. What he thought of women in the Air Force as expressed by his comments was far from flattering, and I began to have grave doubts as to whether an Air Force life was the kind of life that suited me. While I was still toying with this doubt, the "bulldog" in-

WITH HIS FIRST WORD OF COMMAND ONE GIRL FAINTED.

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timated that the N.C.Os. should come out and give the words of command, and pointed, I thought, to Sheah. She stepped forward. "No, not you," bellowed the "bulldog." "It is you. You with the red hair." To my horror, I realized he meant me. I suddenly had the feeling that the Air Force could have got along very well without me. In spite of the fact that I felt as though my knees had turned to jelly and that my legs would collapse under me, I appeared to march smartly forward. Just as I was approaching him I noticed Jocelyn, who was now one of our officers, cross the parade ground. She went forward to the "bulldog" and said a few words to him. He turned to me and said, "You are wanted in the Orderly Room. You may go." Had I been a dog I should have licked his face in gratitude, but as I was not, I merely murmured "Thank you, Sir" in a very small voice and shot across the parade ground, calling blessings on the fate that had caused me to become an expert typist and at this moment so indispensable to a very limited clerical staff!

This experience gave me a very distorted view of what the Royal Air Force thought of women in the Service, with the result that when I was posted to the Marine Aircraft Experimental Establishment at Rhu it was with great trepidation that I presented myself at Station Headquarters.

I had been posted in the trade of "Administrative" but as there were only three or four of us there I was to be employed on clerical duties. Station Headquarters, I found, was a large house tucked away in a lovely garden on the edge of the Loch. I was told to report to "Flight." I thought I would prepare myself for the worst, and with a sinking feeling I entered the Orderly Room. Seven or eight airmen were hard at work. All the desks were neat and tidy and there was a pleasant air of happy efficiency permeating the room. Betty, who had preceded me by a few days, was sitting at a desk looking most efficient. From a table by the window someone rose up. The light caught the crowns on his sleeve and I mumbled in a stupid sort of way, "You must be 'Flight'." He was a slightly less than middle-aged man with greying hair and a very pleasant smile. His smile reassured me and my doubts and fears vanished. From that moment "Flight" was my great help and inspiration in the months that followed.

I was introduced to the mysteries of the Central Registry, with its innumerable files and registers. The two young ex-policemen who were known as "Runners" intrigued me. I could not understand why they were called "Runners," as they seemed to do everything but "run." One of them spent most of his time writing the most gory murder stories, while the other seemed to make constant trips to the local bun shop, coming back laden with doughnuts and cakes. Then there was the Orderly Room, where I was instructed how to make out route forms and railway warrants, type Daily Routine Orders and learn the correct Service procedure in correspondence. Last of all, but most important, was the Secret Registry. This latter was "Flight's" personal responsibility and pride. "Flight" was on the point of explaining to me the mysteries of these pink and green files of the locked cabinet when he was called away. The important-looking pink file on top of his desk more than interested me. I was longing to peep inside. I had had no idea that beer houses came in for special categorization in the Air Force, and here was a file which must surely contain some very interesting information. Possibly these places were used to trap spies. All sorts of possibilities occurred to me. I was pleasantly engaged in such flights of fancy when "Flight" returned. He lifted the file. My heart beat excitedly, and when he remarked, "These publications . . ." I heard no more. I was inwardly chuckling to myself and wondering what "Flight" would have thought had he known what had been passing through my mind a few minutes earlier. The file was marked "Secret and Confidential Pubs"!

A few of us from No. 4 City of Glasgow Company who were now becoming firmly established at Rhu were joined by Jocelyn and Mona, who, as officers, were in charge of the Detachment. Early in December about thirty airwomen from various parts of the country were posted in to form the nucleus of the W.A.A.F. Detachment. Billeting proved to be rather a worrying problem for a bit, as the majority of the householders were under the impression that they would receive considerably more remuneration from the Air Ministry than they were paid. However, after re-arranging a few of the billets to more patriotic or less impecunious citizens, the W.A.A.F. were thus accommodated until the end of February, 1940, when the whole Detachment took up residence in "Shorelands," Rhu, the W.A.A.F. hostel. This was a lovely residence on the side of the Loch, with tennis court and delightful rock garden and spacious grounds stretching to the hills at the back. For us the trials and tribulations of billeting were over, but the toil and worry of transforming a dwelling-house into a disciplined hostel had begun. "Many hands make work light" proved no exception in this case, and when all had set to and helped with the scrubbing and cleaning and arranging furniture, very soon we were all happily settled in our new abode. Unfortunately, there was an epidemic of

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German measles and the airwomen made their contribution to the toll of victims. So long as the epidemic lasted we were kept in quarantine and this proved most trying, as we were debarred from all places of entertainment for about six weeks in all.

The local residents were most hospitable and seemed happy to have us in their midst. We were most grateful to Mrs. Bligh, a Helensburgh lady, who was instrumental in organizing regular dances for us, and once a fortnight there was a hectic shining of buttons and shoes, all with the idea of dazzling the fair youth of Helensburgh.

The tennis court at "Shorelands" proved a great asset, but the seven-day working week left us little time to enjoy the amenities of our lovely hostel. We arranged a few social evenings when we invited the airmen from the Station, and, as by this time we were all now resplendent in our W.A.A.F. uniforms, as depicted by the "large woman" on that June night almost a year ago, the pressing of tunics and skirts was of primary importance on these evenings.

We all very soon settled down to our various jobs. There were clerks, telephonists and teleprinter operators at Headquarters; cooks, kitchen staff and transport drivers at "Ardenconnel," the airmen's hostel, and our own cooks and domestic staff at "Shorelands." Each morning the Station Headquarters staff would parade outside the hostel and were then marched down the road to Headquarters, a distance of about half a mile. Locally, we were a great attraction to the children, who waited for us as we marched along and handed us flowers. The remarks of the children on these occasions were most amusing. Jocelyn was known as "Skinny the leader." I was the "Red-headed Sergeant." "Dorothy" was known as "Tammy heid," by virtue of the fact that her head not being regulation size, she had not yet been issued with a hat and was still attired in the original beret. Molly, a pretty little Corporal with masses of dark curls and sparkling eyes, partly concealed behind large horn-rimmed spectacles, was known as "Specky curls." When Jocelyn gave the command, "Right wheel," the children immediately shouted "Cart wheel," "Bicycle wheel." "Eyes left" was followed by "Eyes in the back of your head," and similar remarks. Each day more and more flowers appeared, and I was alarmed in case an irate parent should accuse us of robbing his garden. I therefore tackled Billy (aged ten), one of our most ardent admirers. I asked him where they were getting the flowers. He replied, "Oh, it's all right. They are growing down by the old sewer pipe on the side of the Loch"!

The days passed quickly, all of us feeling that we were doing a worthwhile job—the cooks and kitchen staff, the telephonists, the teleprinter operators, the transport drivers and the clerks. So busy were we and feeling so removed from the conflict in the peace of this lovely Scottish village, that the trend of the war did not appear to interest us much until that day in June, 1940, when the news came through that the French had capitulated. The war once more became a reality and for the moment a feeling of depression spread over the W.A.A.F. Section. Something had to be done about it. It was agreed that anyone who appeared "jittery" or was heard to say she was "fed up" or "browned off," or suggested that we would not win the war, was to be fined sixpence, the money to be placed in the Red Cross box. This caused considerable amusement, and as we were all generally financially embarrassed, the imposition of such a fine apparently achieved its purpose as soon everyone was bright and happy again, and the Red Cross Fund, on this occasion, did not benefit materially from contributions. Thus passed for us those momentous Dunkirk days when the fate of our country was in the balance.

We were, however, gradually becoming a regimented force. Physical training on the front lawn of our hostel started off our day, followed by drill and the morning working parade, and then off to our various jobs. Church parades to the local church each Sunday were also part of our routine. Therefore, it did not come as a surprise to us when one day the following notice appeared in our Daily Routine Orders:

> "Discipline—Station Parade. A full muster of airmen and W.A.A.F. personnel is to be held at 'Ardenconnel' on Thursday, 25.7.40, at 0830 hrs."

Thus was the first route march of the Station personnel intimated. The morning was exceedingly fine. The sun was shining from a blue sky when we left "Shorelands" at eight-fifteen and proceeded to "Ardenconnel." As the distance by road was about a mile, we took a short cut uphill through a field. Jumping over muddy patches, taking detours round pools, scrambling up over hillocks, onwards we marched, crossed a stile, and with scarcely a break in our ranks and like gladiators entering the Forum, we joined the Flights of airmen on the parade ground. Soon the long column of blue marched off, the W.A.A.F. Flight taking up the rear. As the first half-mile was downhill, we found the marching very easy and soon we reached the Gareloch Road. This road opens on a fairly steep incline, which had the effect of slackening down the pace, but while we in the rear Flight were still negotiating the incline, the first Flights of the column had already

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reached easier ground and were increasing the pace. Therefore, at this early stage, a few of us felt *hors de combat*. Fortunately, this condition was only temporary. However, we were finding difficulty in keeping in step and had to change step so frequently that we appeared to be doing a *pas de bas*. The men commenced singing and whistling popular choruses, assisted by those of us in the W.A.A.F. Flight who had recovered our breath. Thus we marched by the side of the Loch for about two miles. The W.A.A.F. Flight led the parade on the return march and experienced less difficulty in keeping in step. As the pace varied according to the tune, "Poor old Joe" succeeding "Oh, Johnny," proved more popular with the W.A.A.F. Approaching the last lap it was apparent that the whole repertoire of choruses had been gone through when the strains of "Onward, Christian Soldiers" came wafting over our heads. This was followed by a second rendering of "Ten Green Bottles," which inspired us to fresh energy, and we finished up in fine style.

"Shorelands," our hostel, was gradually losing its austere appearance. We had acquired curtains, rugs, cushions and flowers, and we were all very happily established. As we had anticipated many visitors, we purchased a "Visitors' Book," a benevolent P.S.I. making this possible. There it lay on the hall table for many months, quite unused, until one day it proudly displayed, "Alice, 11th October, 1940." This first entry signified a memorable day in our history. H.R.H. The Duchess of Gloucester honoured us with a visit. Following several wet and stormy days, it was with some relief we awoke on the morning of the Royal Visit to find the sun shining. Although we had been informed of the visit a week previously, the morning of the 11th found us all greatly excited. Our Royal visitor arrived about noon, and after visiting the various sections at Headquarters and seeing the airwomen at work there, she arrived at "Shorelands." Everything was in order. The kitchen staff, looking very trim and tidy in neat little gingham aprons, appeared to be giving the final touches with obviously freshly washed dusters. They were really flicking away imaginary dust from the already well-dusted banisters. In the kitchen, the cook in her clean, white overall, apparently conscientiously tending the dinner roast, was more or less performing the last rites on what should have been cold roast. Whilst being cooked it had been overlooked in the excitement of the morning and now presented a charred mass. As the Duchess approached, the cook quickly pushed it back into the oven and so removed it from view!

It was arranged that the W.A.A.F. should form a guard of honour for Her Royal Highness's departure. The previous night, tunics and skirts had been pressed and buttons cleaned and polished till they shone like gold. About ten minutes before the parade, when we were all checking up on each other, straightening hats, tucking in stray pieces of hair, dusting shoes and giving tunics and skirts a last brush down, the Commanding Officer announced that we had to wear our greatcoats. There was pandemonium. Everyone dashed upstairs. Greatcoat buttons had to be cleaned. Rooms had been so carefully tidied for the Royal Visit and bits of kit, like button-cleaning material, tucked so far out of sight that it could not easily be found. By the time everyone was ready and got on parade it was a somewhat dishevelled and breathless W.A.A.F. Detachment that waved "goodbye" to the Royal visitor.

The weeks rolled past. The war was now in its sixteenth month. Mr. Chamberlain had resigned and Mr. Churchill had become Prime Minister. Belgium and France had capitulated and the evacuation of our forces from Dunkirk had made history. Denmark and Norway had been invaded. Italy had declared war. The Battle of Britain had been fought and won. Heavy German air attacks had been made on our ports, our shipping and our airfields. The London "blitz" had begun. Coventry had been savagely attacked. Wavell's desert offensive had been opened and Sidi Barrani and Sollum captured. Now Christmas, 1940, was upon us.

As many of us were spending our first Christmas away from home, no efforts were spared to make the Christmas Dinner at "Shorelands" a success. Gaily coloured streamers, holly and mistletoe completely transformed the dining-room. By the window stood a Christmas tree, decorated with tinsel and coloured papers, and laden with interesting-looking little presents. Snow-white tablecloths, holly-patterned serviettes, brightly coloured crackers, gleaming cutlery, shining wine glasses, glowing yellow oranges, and plates loaded with nuts and sweets all contributed to the banqueting atmosphere. The yule log had not been forgotten and burned brightly in the huge fireplace. The fresh, yellow daffodils in the vases seemed to be bending their heads to read the artistically decorated menu cards which gave a clue to the "things to come." These represented more than a pious hope, as in "the proof of the pudding . . ." every course proved to be a revelation. If a little ingenuity had been shown in the names, it was only equalled by the ingenuity shown in the cooking. Plebeian rice soup assumed a regal air as "Nuptial Consommé."

Cards were placed at the respective places in-

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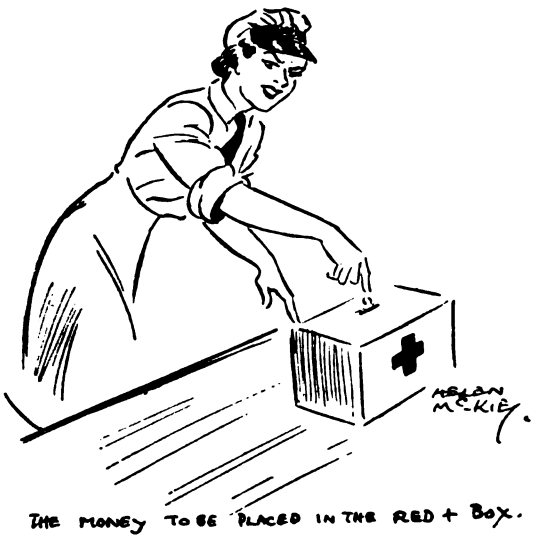

THE MONEY TO BE PLACED IN THE RED + BOX.

dicating the positions at table according to rank, and quite an amusing few minutes elapsed before all were seated. Meanwhile, in the kitchen, bedecked in businesslike white overalls, Jocelyn, Mona and myself were contemplating with some dismay the assortment of pots and pans on the stove, and the mountains of plates on the table. However, we set to and the "Nuptial Consommé" was served up in record time. If the last two or three plates contained decidedly more "consommé" than "nuptial," it passed unnoticed in the excitement of banging of crackers, blowing of whistles and donning of paper hats. Serving the turkey and pork with their various accompaniments proved quite a task, but three pairs of hands soon accomplished the deed, and if the methods of serving resorted to in the kitchen, after every available clean spoon had been utilized, were somewhat primitive, the appreciative comments one could hear in the dining-room proved the truth of the saying, "What the eye does not see the mouth will not taste"! The plum pudding, decorated with holly, was ceremoniously paraded and proved to be as delicious as it looked. The "Coupe Shorelands," served in dainty little waxed cups, was merely masquerading fruit salad decorated with cream and a

I WAS THE ONLY ONE REMAINING AT RHQ

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cherry saucily perched on top. Then followed the toasts, "The King," followed by "Thé Royal Air Force" being toasted in sherry, port and orange and lemon squash. The Christmas tree ceremony was next on the programme. Each of us had previously contributed the sum of sixpence towards this. The little parcels on the tree were numbered. Draws were made for presents and the usefulness of the gifts and the variety reflected great credit on the committee who had made the purchases. This over, all retired to the recreation room where coffee was served. Thus concluded our first W.A.A.F. Christmas dinner, and one which afforded some consolation to those of us who had been unable to get home for Christmas, and left us with yet another happy memory of our days in the W.A.A.F.

The early months of 1941 found us still working hard at our respective trades. Our evenings were taken up with various duties, such as fire spotting, duty watch and duty N.C.O. Facilities were provided for evening classes locally and many of the airwomen attended these. We received lectures on gas, fire, incendiary bombs and hand grenades. Our respirators had to be carried daily and we all had to wear them for a certain period each week. We now knew how to connect up the fire hose to the hydrant, how to deal with incendiary bombs, and how not to handle hand grenades. Our hostel had been provided with an air raid shelter, and on the many occasions when we were awakened by the noise of anti-aircraft guns or the Station siren or both, the discipline and training which we had been subjected to proved an invaluable asset. There was never any sign of panic, even when some bombs fell comparatively near. We had, however, experienced little of air raids compared with other parts of the country, until the evening of Thursday, 13th March.

Shortly after 9 o'clock the eerie wail of the sirens disturbed the peace of a lovely moonlight night. Soon the not unfamiliar throb of enemy planes filled the air, accompanied by the roar of gunfire, which gradually increased in volume until it seemed to us that a second Battle of Britain was being fought over our heads. Wave after wave of planes passed over, and the distant explosions and the ever-increasing gunfire told us all too clearly that a large-scale attack was being made somewhere on the Clydeside. We at once installed ourselves in our air raid shelter. After three hours of this ceaseless throbbing of planes and the terrific gunfire which echoed and re-echoed from the surrounding hills, when it was obvious that the attack was concentrated farther up the river, it was considered safe for us to return to the house and get to bed. Some shrapnel was falling as we ran from the shelter to find ourselves in the doubtful safety of "Shorelands." Here it seemed that the whole house would collapse about us. Windows and doors were rattling and each burst of gunfire seemed to rock the whole foundations. However, as most of us were rather exhausted, we quickly and quietly retired. I was still awake, however, in the early hours of the morning. Outside the noise was terrific and the doors and windows continued to rattle. Inside the house itself there was not a sound of life, when, from the next room, I heard a little voice repeating, "Grace, Margaret, Morag, Grace, Margaret, Morag." I listened, and this monotonous rhyme went on for what seemed an interminable age, the tone rising and falling with each burst of gunfire. I listened for some response from Grace, Margaret and Morag. I thought it must be impossible to sleep through the dreadful noise, far less the plaintive pleadings of Jessie. Were they all unconscious? I must confess I felt somewhat relieved when, at last, I heard Grace, Margaret and Morag one by one answer to their names. I slipped in to ascertain what was the trouble and found Jessie trying to convince her room-mates that bombs were falling on the front lawn. I assured them that the noise was merely the guns, and some distance away. It took some time to reassure Jessie, however, but eventually she seemed satisfied. Grace, Margaret and Morag, having been aroused out of a deep sleep, were now wide awake and unable to get to sleep again. Meanwhile, "Jessie," having been awake all night, was now so thoroughly exhausted that she soon fell fast asleep!

Next evening, while the Clydeside received its second murderous attack, we again suffered no more than the discomfort of noise.

In spite of the shock which the two-day "blitz" on the Clydeside had given us, when the full details were known, the daily routine went on. A cycling club was formed, the tennis court was put in order and play commenced, and hockey matches were arranged between mixed teams of airmen and W.A.A.F. and ratings and W.R.N.S., and so life went pleasantly on.

As the weeks passed, so did changes take place in the personnel. By June, 1941, of the original members of No. 4 Company, I was the only one remaining at Rhu.

As they all disappeared from view, I felt that this was the end of my happy days in the W.A.A.F.

Now, five years later, I know that was only the beginning!

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Council of Voluntary War Work

The Prime Minister was present at a dinner given at Claridges Hotel by the Voluntary War Work Council to Sir Frank Willis and other members of the Council on 18th September.

Among those who accepted invitations were: Mr. F. J. Bellenger, M.P., Minister of War, the Lord Mayor of London, Admiral Sir John Cunningham, Mr. Arthur Power, Marshal of the Royal Air Force Lord Tedder, General Sir Ronald Adam, General Sir Frederick Pile, the Moderator of the Church of Scotland and the Rev. P. T. B. Clayton.

The Prime Minister, in his speech, paid tribute to the great work which the voluntary organizations had done and were still doing, and said the spirit of voluntary service was a characteristic of the British people. He had seen enormous advances made in the care of fighting men, but the voluntary work had never slackened, nor had the need for it lessened. Nearly a quarter of a million volunteers were enrolled in the various voluntary services and were directed by a staff of only 12,000 whole-time workers. Those workers took everything in their stride and nothing stopped them.

All those serving, said Mr. Attlee, were inspired by Christian principles and drew their inspiration from a single source. Difference of creed often meant great and acrimonious differences, but in the voluntary organizations there had been unity and co-operation. There was also today the greatest need for co-operation between people who, although they might have comparatively minor differences, were united on the vital things the world needed.

Many of our men were serving abroad under conditions full of temptation and loneliness, and they needed the work of the voluntary agencies. He was sure the spring of voluntary work in this country would never die out and that there would always be people willing to dedicate themselves to the service of their fellow men, and ideals.

Mr. F. Bellenger, M.P., said the Services were deeply grateful to the work which had been carried out by the voluntary bodies and was still being carried on by the vast voluntary body of people, whose representatives were there tonight. Sir Frank Willis had paid tribute to all the humble workers, but the fact remained that, speaking on behalf of the Services, speaking for those humble other ranks who had been so well looked after by the Council, he wished to express their thanks.

The Right Rev. Dr. Matthew Stewart, Moderator of the Church of Scotland, in his speech said it was still fresh in their minds what had been accomplished by all branches of the Services in recent years, and it was his concern that our fighting Forces should have their numbers and their needs wisely provided for. It was certainly his hope that by every means their life in the Services should be made as pleasant as possible.

General Sir Ronald Adam and General Sir Frederick Pile paid tribute to the work of Sir John Brown, Chairman of the Council of Voluntary War Work.

REMINISCENCES

(*Continued from p.* 171, *Vol.* 18, *No.* 3)

by Wing Commander D. L. Allen
A.F.C., R.A.F. (retired)

No. 4.—CEREMONIAL

CEREMONIAL parades and drill have always been held in greater veneration by the Army than by the Royal Air Force, whose outlook in such matters is more akin to that of the Royal Navy. In military ceremonial the man and the horse hold the centre of a stage whose confines are the parade ground or street, whilst in the case of the two Royal Services it is the ship and the aircraft which provide the principal features of displays set in the vastnesses of sea or sky.

The first recorded instance of British aircraft taking part in a military ceremonial parade* was in 1913, when the Royal Flying Corps (Military Wing) participated in the King's Birthday Parade on Laffan's Plain, Aldershot. What memories the name arouses: the scarlet and blue of the Line, the kilts and bonnets of the Highlanders, the bearskins of the Guards, the piebald drum-horses with their silver kettle-drums, the blue and gold of the Royal Horse Artillery, who, when on parade with their guns, took precedence over all other troops.

Precedence, that was where the difficulty arose. Where were the Royal Flying Corps and their aircraft to be posted, and how were they to "march past"? From the outset any idea of a fly past had for various reasons been ruled out, so a procedure had to be devised which would enable the aircraft to participate in the parade and yet be clear of the limited area available when the troops began to carry out the standard ceremonial movements. The aircraft were con-

*Aircraft had previously flown at a naval review at Spithead.

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sequently to be drawn up in lines of squadrons, on the right of and at right angles to the lines of the troops. After the inspection by the Duke of Connaught the aircraft were to taxi along the avenue formed by the front line of troops on their left and the saluting base on their right. Disposed in groups of four men spaced out along the flanks of the aircraft taxi-ing in "line astern," the air mechanics were to march. Parties of men were also detailed to wheel off any machines whose engines stalled, a not-infrequent occurrence in view of the high proportion of Gnome engines. The general impression given by this medley of little groups of marching men flanking an assortment of aircraft, varied in type, engine and taxiing speed, caused a spectator at the dress rehearsal to remark that it only needed, as a finishing touch, the massed bands to play "White wings, they never grow weary"!

For Alan the King's Birthday Parade ended in humiliation, for just as he reached the saluting base his Gnome engine spluttered, choked and stopped dead. Ignominiously he and his Short Pusher were trundled to the rear. But even worse was to befall him later, for as he taxied fast up the straight from Laffan's Plain to the hangars at Farnborough he failed to note, until it was too late, the ditches of the road traversing the aerodrome. The wheels of the Short subsided into the mud, forcing the undercarriage through the bottom plane. Fate now decided to shape a kindlier course. Having technically "crashed," Alan was entitled by the rules to forty-eight hours' leave. This he put to good use, for he saw "Craigenour's" eventful Derby from the box allotted to the King's Indian Orderly Officers.

The events on Laffan's Plain had their repercussions, for the next year flights from Nos. 3 and 4 Squadrons flew past on the ceremonial parade of the Tidworth Garrison with no ill-effects to the troops or to their horses. Thus the fly past came to be established as the proper method of participation of aircraft in military ceremonial parades.

Prejudice, however, died hard, especially in India. So it was not surprising that an old-fashioned General would not hear of a fly past by the Royal Air Force on the ceremonial parade of the Peshawar Garrison on the occasion of the Prince of Wales's visit to India in 1922. It was agreed therefore that the Royal Air Force should supply a detachment on foot, which as representing the Junior Service should march past after the Army units. In India the last units to march past were the transport and pack-mule companies of the Royal Indian Army Service Corps. Their passage raised considerable dust, and the mules left unmistakable evidence of their recent presence. The orders for the parade laid down that the Royal Air Force should march twenty-five paces in rear of the mule companies, but at the rehearsal the officer in charge very naturally hung back so as to let the dust drift away and settle before he brought his detachment past the saluting point. This did not please the General, who was a stickler for rigid obedience to orders, and his annoyance, to put it mildly, was considerable when the R.A.F. officer politely but firmly declined to march in the dust of the mule companies. Later that morning a senior Staff officer rang up the Wing Commander and complained about the R.A.F. detachment and their officer. Fortunately the Wing Commander had been fully informed of the circumstances, and even more fortunately he happened to be that past master of the retort courteous, "Ginger Mitch" (the late Air Marshal Sir William Mitchell). "Mitch" listened patiently to the recital of the misdeeds of the R.A.F. At length he replied: "Pray, give my compliments to the General, and say that I regret I cannot agree that the Royal Air Force should march in the dust of the mule companies. They will march fifty or two hundred and fifty paces in rear as may be requisite, and if necessary I will arm them with dust-pans and shovels!!"

The steadiness and martial bearing on parade of airmen have often and with justice earned the praise of onlookers, not the least enthusiastic of whom was a distinguished French General on the occasion of the funeral of Marshal Foch. The British forces who had fought under that great leader were represented by picked detachments of the Coldstream Guards with band and Colour, and of the Royal Air Force. In the long procession from Notre Dame the appearance, marching and precision in arms drill of the British contingent were remarkable. The climax of the ceremony was the final march past in front of the Invalides of all the troops, who, with drums beating and Colours flying, rendered the last honours to the great Marshal.

The French General, who was bear-leading the foreign notabilities, gave an informal running commentary to his charges.

"Les Belges, ah, qu'ils sont bien les Belges!" he exclaimed as the Belgian Chasseurs, headed by their bugle band, went by to a lively quick-step. Then came the Coldstreamers to the strains of "Lorraine," played by their band out of compliment to Foch, a native of that province, marching with the air of men who knew they were doing something very well. They were followed by the Royal Air Force. As the latter approached, the General, pointing excitedly, cried:

"Les Portuguais! Regardez-moi ça Messieurs, les Portuguais! Mais! Qu'ils sont superbes!"

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Air Operations by the A.E.A.F. in N.W. Europe from 15th November, 1943, to 30th September, 1944

Extracts from the despatch by the late AIR CHIEF MARSHAL SIR TRAFFORD LEIGH-MALLORY, K.C.B., D.S.O., Air Commander-in-Chief, Allied Expeditionary Air Force, submitted to the Supreme Allied Commander in November, 1944

SINCE this Despatch covers the air support of the assault of Europe and the subsequent land operations, it necessarily includes reference to the strategical operations of the United States Eighth Air Force and the Royal Air Force Bomber Command in addition to the operations of these two Air Forces and the Royal Air Force Coastal Command directed to the tactical support of the assault.

As the period covered by the Despatch extends over ten and a half months of the most heavy and concentrated air war in the history of the world, I have not attempted to deal with the events on a day-to-day basis. Rather I have taken the tasks undertaken in the preliminary and preparatory phases and in the assault and post-assault phase, and have attempted to show how these tasks were fulfilled, as well as briefly indicating what I feel are some of the outstanding features of these air operations.

PART I.—COMMAND AND CONTROL

Formation of A.E.A.F.

By a directive (reference COSSAC (43) 81) dated 16th November, 1943, issued by your Chief of Staff, I was informed that the Combined Chiefs of Staff had appointed me Air Commander-in-Chief of the Allied Expeditionary Air Force under yourself as the Supreme Allied Commander, and that I was to exercise operational command of the British and American tactical air forces supporting the assault of Western Europe from the United Kingdom. I was also informed that a United States General would be appointed Deputy Air Commander-in-Chief, Allied Expeditionary Air Force. Major-General William O. Butler was the first General Officer to hold this post. He served in this capacity from 1st January, 1944, to 25th March, 1944, and was succeeded by Major-General Hoyt S. Vandenberg, who occupied the position until 8th August, 1944. Major-General Ralph Royce then held this appointment until the disbandment of A.E.A.F. on 14th October, 1944.

Forces Available

The forces under my command comprised the Royal Air Force Second Tactical Air Force and the United States Ninth Air Force and the forces of the Air Defence of Great Britain. The Royal Air Force Second Tactical Air Force and the formations of the Air Defence of Great Britain passed to my command on 15th November, 1943; the United States Ninth Air Force passed to my operational command on 15th December, 1943, but was not released from its commitment to assist the United States Strategic Air Forces in "Pointblank" operations until 10th March, 1944.

Operation "Pointblank"

During the preliminary period of preparation for the assault, in late 1943 and early 1944, the medium and light-bomber forces of the Allied Expeditionary Air Force continued to lend support to Operation "Pointblank." This was the name given to the combined bomber plan of the strategical bombing forces which had as its aims, first, the reduction of the fighter forces of the German Air Force, second, the general reduction in the war potential of Germany, and, third, the weakening of the will of the German people to continue the struggle. The co-ordination of these operations was effected through a Combined Operational Planning Committee, which was a joint British-American Fighter and Bomber Committee responsible for planning daylight operations when the United States Army Air Force heavy bombers took part. During this preliminary period the operations by Allied Expeditionary Air Force medium and light bombers in conjunction with, and in support of, United States Eighth Air Force were given precedence over any other daylight operations. A second committee, known as the 11 Group Planning Committee, co-ordinated operations of the medium and light bombers of the Allied Expeditionary Air Force other than those in the support role mentioned above. The activities of the fighter forces of the Allied Expeditionary Air Force as escort to, and in support of, bombing operations were also co-ordinated through these committees.

Ninth Air Force released from "Pointblank" Commitments

On 10th March, 1944, I forwarded a directive to Commanding General, United States Ninth

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Air Force, advising him that you, as the Supreme Allied Commander, had decided that the time had come for the operations of the Ninth Air Force to be directed towards the preparation of Operation "Overlord" and that it would therefore operate exclusively under the Allied Expeditionary Air Force and be released from the commitment to assist the United States Eighth Air Force in "Pointblank" operations. As an exception to this ruling, such fighters of the United States Ninth Fighter Command as were suitable and available continued to operate as escort to the United States Eighth Air Force when required.

At this time also I advised the forces under my command that the most important assistance the Allied Expeditionary Air Force could give the Army during the preparatory phase would be by attacking the enemy's rail communications, with the object of so disorganizing his railway system that he would find it difficult to supply his divisions in Northern France when the fighting started and still more difficult to bring reinforcements into the lodgment area. Selected rail centres were therefore put in the first priority for attack.

Role of Strategic Air Forces

Until March, 1944, strategic air forces comprising the United States Eighth Air Force and Royal Air Force Bomber Command continued to be employed on Operation "Pointblank" under the direction of the British Chief of Air Staff acting as a representative of the Combined Chiefs of Staff. In March, 1944, as the completion of the preparatory tasks for Operation "Overlord" became more urgent, the Combined Chiefs of Staff directed that "Overlord" should have priority over "Pointblank" and that the direction of strategic air forces should pass from the British Chief of Air Staff to yourself as the Supreme Allied Commander on 14th April, 1944.

You instructed your deputy, Air Chief Marshal Sir Arthur W. Tedder, G.C.B., to exercise for you general supervision of all air forces, particularly in the co-ordination of the efforts of heavy bomber forces to be employed on Operations "Pointblank" and "Overlord." I was responsible to you for all air operations in connection with the latter plan and I accordingly passed to Air Chief Marshal Tedder my requirements for heavy-bomber effort both in the preparatory and assault phases. During May, 1944, the Deputy Supreme Allied Commander decided that all air operations could be more easily planned and laid on at a single headquarters, and the Air Operations Planning Staff of Supreme Headquarters was moved to my Headquarters. The Deputy Supreme Allied Commander and the Commanders of the strategical and tactical air forces then regularly attended my daily conferences at Stanmore, thus enabling all operation orders covering all air forces occupied with "Overlord" tasks to be co-ordinated and given rapidly to the forces to be employed.

Formation of Advanced A.E.A.F.

In order to achieve the most economical and effective employment of the air forces at my disposal for the assault and its subsequent development, I considered it essential that the air operations in immediate and direct support of the land battle should be specially co-ordinated and directed. I therefore decided to establish a small operational organization to be known as Advanced Allied Expeditionary Air Force. Under my general direction the Commander, Advanced A.E.A.F., was given the task of directing and co-ordinating the planning for and operations of such forces of the United States Ninth Air Force and Royal Air Force Second Tactical Air Force as were allotted to him from time to time.

Air Marshal Sir Arthur Coningham, K.C.B., D.S.O., M.C., D.F.C., A.F.C., was appointed Commander, Advanced Allied Expeditionary Air Force, and he undertook this responsibility on detachment from the Second Tactical Air Force. The Commander, Advanced A.E.A.F., was the one air commander with whom the Commander-in-Chief, 21 Army Group, dealt in his capacity as Commander-in-Chief, Land Forces, during the initial phases of the operation. The Commander, Advanced A.E.A.F., had the necessary authority to implement the requests for air action made by the Army, referring to me any requests for air support beyond the resources of the two tactical air forces. Headquarters, Advanced A.E.A.F., was set up at Uxbridge on 1st May, 1944. Its War Room, where meetings to co-ordinate operations of the tactical air forces were held daily, was adjacent to the Combined Operations Room and the Combined Control and Reconnaissance Centres referred to below.

Machinery of Control of Tactical Air Forces

Throughout the preparatory and assault periods, the control of the fighter-bombers and the light and medium bombers of the two tactical air forces was exercised through a Combined Operations Room at Uxbridge. This Operations Room was staffed by representatives of the United States Ninth Air Force and the Royal Air Force Second Tactical Air Force. Also under the direction of the Commander, Advanced A.E.A.F., a Combined Control Centre was set up and operated by the Air Officer Commanding

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No. 11 Group, Royal Air Force, with the full collaboration of the Commanding General, United States Ninth Fighter Command and with authoritative representation of the U.S. Army Eighth Fighter Command. This Combined Control Centre was manned by a British-American staff and was, in effect, the Operations Room of No. 11 Group, Air Defence of Great Britain, with the complete static signals system of the old organization developed over a long period and augmented by additional communication facilities. This Centre planned, co-ordinated and controlled all fighter operations in the initial phases of the operations; it was also responsible for issuing executive instructions for the fighter-bombers.

A Combined Reconnaissance Centre was also operated under the command of the Commander, Advanced A.E.A.F., to co-ordinate and direct the visual and photographic reconnaissance efforts of both the British and United States reconnaissance forces during the initial stages.

PART II.—POLICY AND PLANNING

(a) Operations prior to D Day

Operation "Overlord"

Operation "Overlord" was part of a large strategic plan designed to bring about the defeat of Germany by heavy and concerted assaults on German-occupied Europe from the United Kingdom, the Mediterranean and Russia. A Joint Study and Outline Plan for Operation "Overlord" was completed in July, 1943. This plan was elaborated in more detail under the title "Neptune"—Initial Joint Plan and Maintenance Project-Administrative Plan—by the Allied Naval Commander-in-Chief, the Commander-in-Chief, 21 Army Group, and myself. Operation "Neptune" provided for the launching of an assault from the United Kingdom across the English Channel, designed to secure a lodgment area on the Continent, from which wider offensive operations could be developed.

To cover the operations of all air forces allotted to Operation "Neptune," an Overall Air Plan was evolved which set out briefly the Joint Plan, the command and control of air forces involved, the principal air tasks and their development through the preliminary and preparatory phases, the assault and follow-up, and air operations subsequent to the assault and securing of the lodgment area. The main features of the Overall Air Plan are more fully dealt with in later paragraphs.

To supplement the Initial Joint Plan for Operation "Neptune," joint instructions and memoranda were issued by the Commanders-in-Chief of the Naval, Army and Air Forces.

Overall Air Plan

In the Overall Air Plan I set out the undermentioned principal air tasks for the forces under my command and for the allotted effort of the strategical air forces and Royal Air Force Coastal Command. These tasks were decided upon after discussions with yourself and the respective Commanders-in-Chief as to the requirements of the Army and the Navy from the air forces.

(*a*) To attain and maintain an air situation whereby the German Air Force was rendered incapable of effective interference with Allied operations.

(*b*) To provide continuous reconnaissance of the enemy's dispositions and movements.

(*c*) To disrupt enemy communications and channels of reinforcement and supply.

(*d*) To support the landing and subsequent advances of the Allied armies.

(*e*) To deliver offensive strikes against enemy naval forces.

(*f*) To provide air lift for airborne forces.

The co-ordination of the Air Plans with those of the other Services was achieved by weekly meetings between the other Commanders-in-Chief and myself, together with our respective Chiefs of Staff and Chief Planners. These meetings, held alternately in the office of the Planning Centre of each of the three Services, ensured that each Service was kept informed of the relative development of planning.

Objects of Preparatory Bombing

I considered that the primary objective of preparatory bombing should be to impose the greatest possible delay in the movement of the enemy reinforcements and supplies, and to this end the railway bombing plan was designed. The object of this plan was to produce a lasting and general dislocation of the railway system in use by the enemy. By so doing the capacity of the system as a whole would be greatly reduced, and the task of dealing with isolated movement once the battle was joined would be made all the easier. Accordingly, the primary targets planned for attack were the railway centres where the most important servicing and repair facilities of Northern France and the Low Countries were located; the secondary targets were the principal marshalling yards, particularly those which possessed repair facilities. The selection of targets was made difficult in some cases by the necessity of avoiding heavy civilian casualties or damage to historic buildings. Where railway centres were situated in thickly populated areas (as at Le Bourget, for

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example), alternative centres were chosen in order to isolate them. A further limitation was imposed by the necessity to pinpoint the attacks on these targets; this demanded visual bombing conditions for day attacks and clear weather during moon periods for night attacks. The possibility of unreliable weather, particularly round about D Day, was one of the major factors which dictated an early commencement of this plan; in fact, the weather did seriously hamper its execution. The development of the railway plan and some indication of its success are set out in Part III of this Despatch.

Complementary to the railway plan, a further plan was made, covering the destruction of road and rail bridges. This plan, which called for the cutting of the Seine bridges below Paris and the bridges over the Loire below Orleans, was put into operation at D – 30.

In the formulation and adoption of these plans to cause the maximum overall interference with enemy movements, it was fully appreciated that the more successful were our attacks the more embarrassing it would be to the Allied Armies when they came to move through the same area. This disadvantage, though serious, was felt by the planners to be outweighed by the advantage of preventing the enemy from bringing into the assault area sufficient reinforcements to contain the Allied bridgehead. I have dealt with this subject further in the section dealing with post-assault operations in Part III of this Despatch.

Other preparatory bombing plans included attacks on coastal batteries, enemy naval and military targets and the radar chain. It was necessary to remember when making these plans that the enemy should not be given any indication of the area selected for the assault. The principal effect of this on the preparatory air operations was that at least two attacks were made on each type of target outside of the projected assault area to one attack on a target within that area.

Estimation of G.A.F. capabilities

I was confident that the German Air Force would constitute no serious threat to our operations on land, sea or in the air. However, I could not dismiss the possibility that the enemy was conserving his air forces for a maximum effort against the Allied assault forces. A bombing plan was therefore prepared which aimed at driving the German Air Force fighters on to bases as far from the battle as were the Allied fighter forces, by destroying its bases within 130 miles' radius of the assault area. Enemy bomber bases even farther inland were also scheduled for attack.

Moreover, as I considered it possible that an intense air battle might last for anything up to a week following the launching of the assault, it was necessary to have on hand a strong enough force of fighter aircraft to ensure that the enemy would be completely mastered in any such battle. I refer to the constitution and use of this fighter force in Part III of this Despatch.

"Crossbow" Operations

Throughout the whole of the preliminary and preparatory phases of the operation I had to take into account the need to maintain a sufficient weight of bombing attacks on "Noball" targets. "Noball" was the code word used to designate the sites being prepared by the enemy for attacks on the United Kingdom with flying bombs and rockets. The operations against these sites carried out under the title of "Crossbow" had begun as early as 5th December, 1943, and constituted a considerable diversion of bomber effort. This bombing, while it did not of itself succeed in completely eliminating the menace of the flying bomb, was fully justified, in view of the fact that the original scheme had to be abandoned by the Germans. Details of the effort involved and an indication of the results achieved are given in Part III of this Despatch.

The diversion of bombing effort on to "Noball" targets, however, was not wholly unprofitable, even if judged from the point of view of "Neptune" alone. The medium and light-bomber crews gained invaluable experience in finding and attacking small and well-concealed targets, and inevitably improved their standard of bombing accuracy. Moreover, much of the flying in these winter and spring months was carried out in very bad weather conditions. Again the crews gained invaluable experience in instrument flying through bad weather. These were all gains that were to stand us in good stead later in the battle.

(b) Operations during the Assault

My plan for the use of air power in direct support of the assault called for the fulfilment of the following principal air tasks:

(*a*) To protect the cross-Channel movement of the assault forces against enemy air attack, and to assist the Allied naval forces to protect the assault craft and shipping from enemy naval forces.

(*b*) To prepare the way for the assault by neutralizing the coast and beach defences.

(*c*) To protect the landing beaches and the shipping concentrations from enemy air attack.

(*d*) To dislocate enemy communications and control during the assault.

To accomplish these tasks, detailed plans were produced and a record of the manner in which

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these plans were put into operation appears in Part III of this Despatch.

(c) Operations subsequent to D Day

The planning of air operations during the post-assault phase of the battle was along two lines. The first part included the continuation and expansion of attacks designed to interfere with the movements of enemy supplies and reinforcements, in addition to other detailed plans covering the operations of the heavy-bomber forces in close support. These plans were produced at my main headquarters. The second part of post-assault planning covered the changing needs of the ground situation and this day-by-day planning was co-ordinated and controlled through the Headquarters of Advanced A.E.A.F.

PART III.—NARRATIVE OF OPERATIONS

(a) Preliminary Period

Air Superiority Essential

Air superiority was the principal prerequisite for the successful assault of Europe from the West. The winning of air superiority was therefore the cardinal point of air planning. Air operations to ensure that the requisite degree of air superiority had been gained by D Day were begun in the preliminary phase and continued during the preparatory phase. On D Day itself a series of concentrated attacks was made on the German Air Force airfields in the preselected area; but as a result of the earlier operations I was confident that the necessary degree of air ascendancy had been gained some time before D Day and advised yourself, the Allied Commanders and the Chiefs of Staff to this effect. In the event, the German Air Force was more impotent than I expected.

I have set out in the following paragraphs some of the efforts of the strategical bomber forces directed to securing air superiority during the preliminary period. The medium and light bomber forces of the A.E.A.F. were throughout this period engaged in support of the strategical bomber programme and in meeting the commitment for attacks on flying bomb and rocket sites.

The long-term strategic bombing plan directed against enemy centres of production and assembly of aircraft and aircraft components, principally by the United States Eighth Air Force and also by Royal Air Force Bomber Command, and the United States Fifteenth Air Force operating from the Mediterranean, inflicted crippling blows on the supply and maintenance organization of the German Air Force. Moreover, the heavy daylight raids of the United States Eighth Air Force into Germany achieved a steady attrition of the German fighter forces.

Attrition of the German Air Force

How crippling these blows were on German aircraft production is illustrated by information obtained from Intelligence sources. . . .

Parallel with the attacks on production centres by the strategic air forces, a campaign of day and night intruding against enemy airfields, designed to hamper enemy training schedules as well as to destroy the enemy in the air, was carried out by aircraft of A.E.A.F. with very great success. In addition, many heavy attacks were made in the preliminary period on the enemy's airfields, which achieved considerable destruction of airfield facilities.

It became evident during this period (November, 1943, to May, 1944) that the High Command of the German Air Force was pursuing a policy of conserving its air forces for the defence of vital targets only. This policy made it extremely difficult to get the German Air Force to fight. Even large-scale fighter sweeps failed to produce any serious reaction. . . .

(b) Preparatory Period

Method of Presentation

Since the war began all attacks against enemy targets have, in some measure, influenced the situation prevailing on the eve of the assault. The commencement of the preparatory phase for this Despatch I have, however, fixed at 1st April, 1944, except in so far as detailed co-ordinated plans for attacks on targets of specific importance within the framework of the "Neptune" plan were in operation earlier. In these cases I have included all the attacks made in accordance with the complete plan.

For convenience of presentation, I have dealt with these preparatory operations under the headings set out below. These headings cover the various operations, planned and carried out to fulfil the tasks laid on to the air forces (see earlier paragraph):

Dislocation of enemy lines of communication, including destruction of bridges.

Neutralization of coastal defences.

Disruption of enemy radar cover and W/T facilities.

Attacks on military facilities.

Harassing of coastwise shipping, and sea mining.

Attacks on airfields.

Air reconnaissance.

Protection of the assembling assault forces.

"Crossbow" operations.

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Type	*Ninth Air Force*	*Royal Air Force*
Medium Bombers	496	70
Light Bombers	96	38
Fighters and Fighter Bombers	607	1,764
Transport Aircraft	865	225
Gliders	782	351
Reconnaissance Aircraft	63	156
Artillery Observation Aircraft	—	164
	2,909	2,768

Strength of A.E.A.F. at 1st April, 1944

Details of the composition of the forces at my disposal at 1st April, 1944, are given in Appendix "C."* The number of operationally available aircraft on hand at that date in these Commands was as follows: (see above)

Dislocation of Enemy Lines of Communication

Next to the winning of air superiority, the dislocation of the enemy's lines of communication was the most important task set the Air Force (see earlier paragraph). The basic intention of my plan for attack on the enemy lines of communication was to force the enemy off the railways, initially within an area of 150 miles from the battle front. There were two broad plans for doing this: one was a short-term policy which involved attacks on certain rail centres during the period immediately before D Day; the other was a longer term plan of destroying the potential of the railway system in North-Western Europe.

The short-term policy involved attacks on seventeen specially selected rail focal points, plus an extra seven points as cover. It was claimed for this plan that if the attacks were made immediately before D Day the enemy's reinforcements by rail would be adequately delayed. Further, it would allow the bomber forces to continue attacks on "Pointblank" and other strategic targets until just before D Day. Complete success would, of course, have been necessary with all the seventeen primary targets to achieve the desired result; moreover, several of the targets chosen were unsuitable for air attack, either by virtue of their location or their nature as bombing targets. Other disadvantages of this plan were that any failure to achieve complete success on the primary targets would have meant that the enemy could direct traffic through such gaps as would be left; the attacks would have to be made at a time when other demands on the available bomber forces were strongest; the successful outcome of a programme covering such a short period would depend entirely upon favourable bombing weather conditions—such conditions could never be guaranteed even in the summer.

The longer term plan involved attacks on a large number of repair and maintenance centres designed to reduce the movement potential and the motive power of the railway system, supported by complementary action in cutting railway lines and bridges on the canalized routes nearer D Day. There were, however, limitations to this longer term plan. It would take longer to implement and would involve a greater diversion of the total effort of the bomber forces. If successful it would hamper the Allies as effectively as it did the enemy, when the Allies came to move over the same territory. It was, however, a much more certain way of achieving the primary object stated above, and was less dependent upon a period of good weather near D Day.

In March, 1944, in consultation with the British Chief of Air Staff, Marshal of the Royal Air Force Sir Charles Portal, G.C.B., D.S.O., M.C., the Commanders of the Strategical Air Forces and the representatives of the land forces, you accepted the longer term plan, and the targets selected for attack were allocated to the respective forces.

Later, the initial plan was amplified and the area selected for attack was greatly expanded. In fact, finally it had little limitation.

Attacks by heavy and medium bombers on railway centres were maintained up to and after D Day. From D – 7 they were supplemented by attacks designed to cut the lines and halt or destroy such traffic as could still be moved. In these tasks, fighter-bombers played the major part, although the medium and heavy bombers also co-operated. The principal targets in these attacks were bridges, junctions, cross-overs and tunnels, as well as locomotives and rolling-stock.

By D Day, of the eighty targets allocated, fifty-one were categorized as being damaged to such an extent that no further attacks were necessary until vital repairs had been effected; twenty-five were categorized as having been very severely

*Appendices not reproduced.

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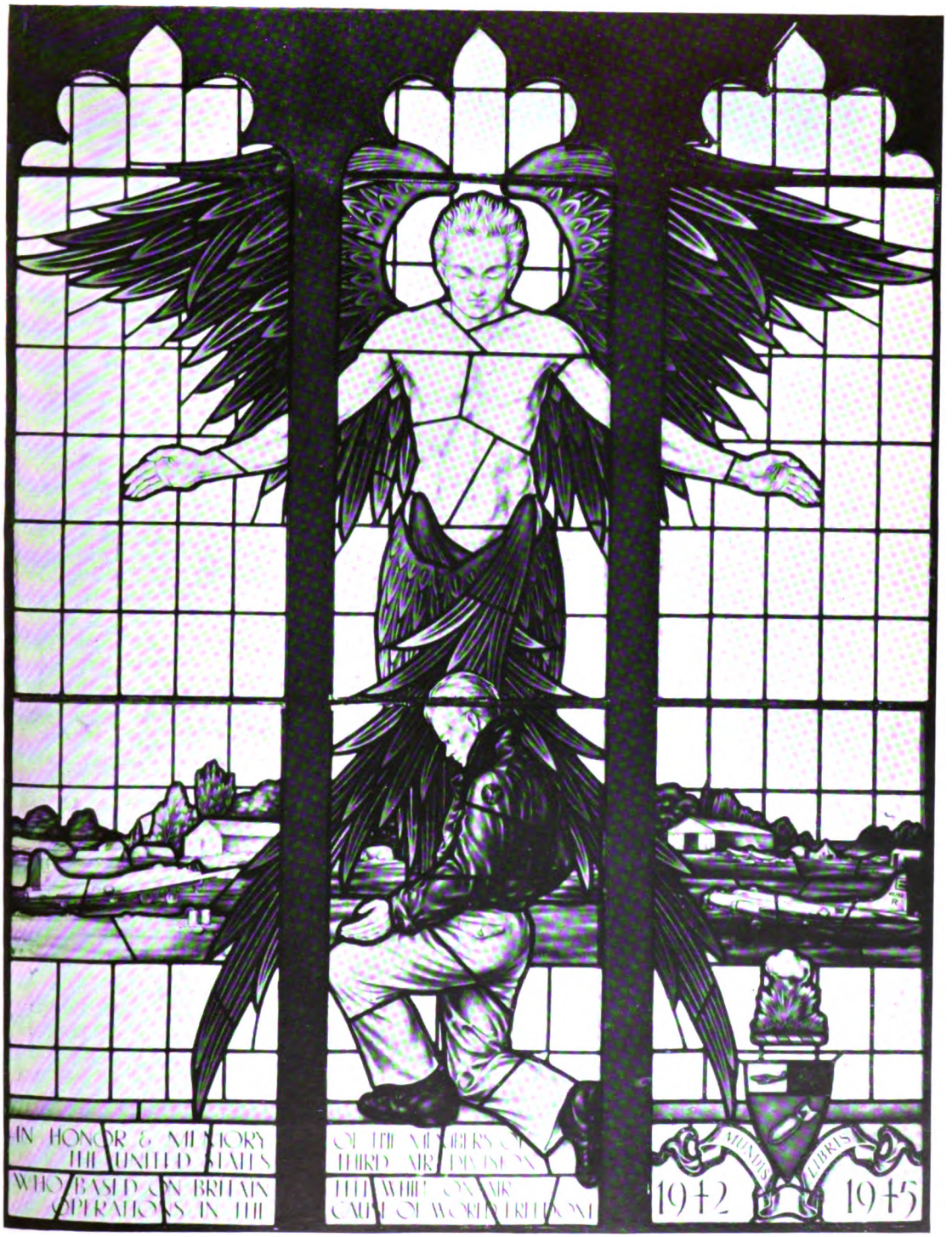

The Memorial Window in Elvedon Parish Church, Suffolk, dedicated to the United States Third Air Division

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MARSHALS OF THE ROYAL AIR FORCE

Lord Tedder **Lord Trenchard** **Lord Portal**

Taken on the occasion of the unveiling of the Battle of Britain Memorial in Westminster Abbey

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Force	*Cat "A"*	*Cat "B"*	*Cat "C"*
A.E.A.F.	14	2	2
R.A.F. Bomber Command	22	15	2
U.S. Eighth Air Force	15	8	—

damaged, but with certain vital installations still intact, necessitating a further attack; the remaining four were categorized as having received little or no damage and needing a further attack on first priority.

The proportion of successes in this respect was as follows: (see above).

In the period of the operation of this rail plan, *i.e.*, 9th February to D Day, a total of 21,949 aircraft operated against the eighty selected targets and dropped a total weight of 66,517 tons of bombs. The scale of effort was as follows: (see below).

In the attacks made by the United States Fifteenth Air Force on 25th May, 1944, and the subsequent two days, 1,600 sorties were flown against fourteen targets and 3,074 tons of bombs were dropped. Of these fourteen targets allocated in Southern France, at D Day five were Category "A," one was Category "B" and eight were Category "C."

During the last days of April and throughout the month of May, 1944, the same high degree of success achieved by the early attacks was maintained. A growing paralysis was being extended over the rail networks of the Region Nord, west of a line Paris—Amiens—Boulogne and South Belgium. In these areas all the principal routes were, at one time or another, interrupted. Other centres to the east and south of Paris had also been attacked.

Photographic interpretation continued to show the devastating effect on the centres attacked, and other intelligence sources confirmed this evidence, as well as supplying indications of damage to signals and ancillary services, damage which did not appear in photographs.

In order to extend the paralysis inflicted on the regions north and west of Paris, attacks were made in the period immediately before D Day on the eastern routes to Paris and the important avoiding routes round the south of that city, and on centres on the Grande Ceinture. Attacks on these centres were considerably restricted by the necessity of avoiding causing heavy civilian casualties or damage to historic buildings. A typical example of this restriction was furnished by the important junction of Le Bourget, which, because of the strong probability of bombing causing heavy civilian casualties, was not attacked at all.

At D Day I believed the primary object of the rail plan had been fully realized. The events which followed confirmed my belief. After the Allied advance, inquiry from the French railway authorities indicated very clearly that pre-D Day attacks achieved the purpose intended. The Nazi-controlled transport system was very badly disorganized. It had therefore become extremely vulnerable to the attention of the medium and fighter-bombers, which in the periods just before and after the assault caused great destruction to immobilized rolling-stock.

Attacks on Locomotive Power.—Attack on repair depots and facilities was the main method of achieving the desired reduction in traction power. It was accepted that these attacks would, at the same time, damage and destroy locomotives. For example, in one such attack about 5 per cent. of the locomotives in the Region Nord were put out of service. In addition, however, it was planned to attack directly trains and locomotives on open lines.

I first initiated special large-scale fighter sweeps against trains and locomotives in Northern France and Belgium on 21st May, 1944. . . .

The total effort by fighters against rolling-stock from 19th May to D Day was as follows :

A.E.A.F.	2,201 sorties
U.S. Eighth Air Force ..	1,731 sorties
	3,932 sorties

With the capacity and flexibility of the enemy rail system destroyed, the enemy armies in the field were denied the freedom of movement necessary to mount decisive counter-attacks. Further, the enemy armies and their supplies were forced on to the road, thus not only slowing up their movement and making them more vulnerable to air attack but also by compelling the enemy to use motor transport making him draw more heavily on his precious reserves of oil and

Force	*Sorties*	*Bombs*
A.E.A.F.	8,736	10,125 tons
R.A.F. Bomber Command	8,751	44,744 tons
U.S. Eighth Air Force	4,462	11,648 tons
	21,949	66,517 tons

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rubber. Air attacks on these road movements eventually forced the enemy to move mainly by night.

During the assault and post-assault phases this stranglehold on the enemy rail communications was effectively maintained. Details of the attacks involved and some evidence of the delay produced in the enemy build-up are given in Part III (*c*) of this Despatch.

Destruction of Bridges.—As I have already explained, complementary to the plan to destroy by air attack the enemy's rail motive power, I planned also to endeavour to destroy all the principal rail and road bridges leading into the assault area. If these were destroyed not only would the enemy's rate of build-up in that area be further checked and his flow of reinforcements and supplies be further impeded but also his ability to escape rapidly from the assault area in the event of his being forced to retreat would be very seriously impaired. The implications of the attacks on bridges were therefore somewhat wider than those of the other attacks on his communications system. In conjunction with these other attacks, the attacks on bridges were designed to seal off the assault area and so force the enemy to stand and fight, and since he could not easily retreat any defeat would be decisive.

The outcome of these attacks was that, on D Day twelve railway bridges and the same number of road bridges over the River Seine were rendered impassable. In addition, three railway bridges at Liége and others at Hasselt, Herenthals, Namur, Conflans (Pointe Eifel), Valenciennes, Hirson, Konz-Karthaus and Tours, as well as the important highway bridge at Saumur, were also unserviceable.

After D Day the assault on bridges of tactical and strategical importance to the enemy was maintained and the results are confirmed in prisoner-of-war reports of the disruption and delay in the movement of troops and equipment which the enemy experienced. Details of these attacks are given in Part III (*d*) of this Despatch.

There can be no doubt that the enemy's transport difficulties after D Day were the result of the cumulative and combined effects of all the attacks levelled against his communications system. The attacks on nodal points in the railway system, the complementary attacks on bridges and the line-cutting by fighter-bombers, all contributed to the restriction placed upon enemy movements.

Neutralization of Coastal Defences

I now come to air operations directed to the support of the landing (see earlier paragraph). These operations had to be begun well in advance of D Day. It was essential, as far as possible, to destroy the enemy's capacity to prevent Allied shipping from approaching the assault area and to blind him to that approach. I deal later, therefore, with air operations during this preparatory period directed to the neutralization of the enemy's coastal defences and the disruption of his radar cover.

There were forty-nine known coastal batteries capable of firing on shipping approaching the assault area. Included in this number were some batteries still under construction. In the conditions that would obtain at the time of the assault it would clearly be impossible for the naval forces successfully to engage all the coastal batteries. They therefore had to be dealt with before the landing, and the air forces undertook this task at the request of the Naval and Army Commanders. I did not consider that aerial attacks against batteries whose casemates were completed were likely to very effective. Fortunately those batteries in the Cherbourg area were the last to be casemated, and it was possible therefore to attack many of them while they were still incomplete.

To avoid showing particular interest in the assault area, it was planned to attack batteries outside the assault area ranging as far north as Ostend, in the proportion of two outside to one within the area.

Interpretation reports revealed that in a great many instances the bombing was more successful than I at first expected; by D Day the majority of the coastal batteries within the area had been subjected to damaging attack.

During the hours of darkness preceding the actual assault a tremendous air bombardment was directed on to the batteries which could not be destroyed within the assault area, aimed at neutralizing them during the critical assault period. This the attacks succeeded in doing. Details of the effort employed are given in Part III (*c*) of this Despatch.

Disruption of Enemy Radar Cover and W/T Facilities

The enemy radar cover on the Western Front was complete from Norway to the Spanish border. This cover was obtained by a chain of coastal stations, each composed of a number of installations. The density of these stations was such that there was a major site, containing an average of three pieces of equipment, every ten miles between Ostend and Cherbourg. This coastal chain was backed by a somewhat less dense inland system and by numerous mobile installations. . . .

The scale and variety of equipment in this

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radar organization were such that completely to destroy the system by air attack alone would have been a formidable proposition. This, however, was not necessary—the destruction of certain vital radars and the comprehensive jamming of others could so gravely interfere with the operation of the system as almost to make it useless. I therefore decided to attack radar stations between Ostend and the Channel Islands in accordance with the following principles:

(*a*) Radar installations which could not be jammed electronically, or were difficult to jam, should be destroyed.

(*b*) Radar installations capable of giving good readings on ships and of controlling coastal guns should be destroyed.

(*c*) Radar installations likely to assist the enemy in inflicting casualties to airborne forces should be destroyed.

(*d*) Two targets outside the assault area were to be attacked for every one attacked in the area.

The attacks had a dual purpose. They aided both current air operations and naval operations in the Channel, and they prepared for the assault by blinding the enemy.

These radar targets were very heavily defended by flak and low-level attacks upon them demanded great skill and daring. Pilots of the R.A.F. Second Tactical Air Force were mainly employed and losses among senior and more experienced pilots were heavy. There is no doubt, however, that these attacks saved the lives of countless soldiers, sailors and airmen on D Day.

* * * *

In addition to the attacks on the enemy radar stations, attacks were also made on the most important of his navigational beam stations and on certain special W/T stations.

Radio Counter-Measures.—On the night of 5th/6th June in the opening phase of the assault, counter-measures against such installations as were still active were put into operation. . . .

The other counter-measures all fulfilled their purpose and it can be stated that the application of radio counter-measures immediately preceding the assault proved to be extraordinarily successful.

* * * *

These results may be summarized as follows: the enemy did not obtain the early warning of our approach that his radar coverage should have made possible; there is every reason to suppose that radar-controlled gunfire was interfered with; no fighter aircraft hindered our airborne operations; the enemy was confused and his troop movements were delayed.

Attacks on Military Facilities

As well as preparing the way for the assault forces by attacking the enemy's coastal defences and radar system, it was planned to prepare the way further for the landing by reducing the enemy military potential, both in the assault and rear areas. Certain ammunition and fuel dumps, military camps and headquarters were considered suitable targets for attack, in order to fulfil this purpose.

Harassing of Coastwise Shipping, and Sea Mining

As a result of the successful attacks on the overland communications of the enemy, his coastal shipping became increasingly important. The task of dealing with this shipping was very largely the work of R.A.F. Coastal Command, but Typhoons of A.E.A.F. also operated on occasions in an anti-shipping role under the operational control of Coastal Command, and Spitfires of A.E.A.F. provided when needed fighter escort to the strike aircraft of Coastal Command. The sea-mining programme was carried out by R.A.F. Bomber Command in direct consultation with the British Admiralty.

The minelaying had as its objectives not only the interruption of enemy coastal shipping but also in the closing stages of preparation for the assault the laying of minebelts, to afford protection to the Allied assault and naval bombardment forces from attacks by E-boats and R-boats, especially those operating from Le Havre and Cherbourg.

Attacks on Airfields

I have already dealt with the preliminary operations designed to wear down the German Air Force and render it powerless seriously to interfere with the assault. As D Day approached, however, it became necessary to ensure that our measure of air superiority was fully adequate to our needs. Plans had accordingly been made for direct attacks upon the enemy air force, particularly in France and the Low Countries. The effect of these plans was to deny the German Air Force the advantage of disposition which its fighter squadrons would otherwise enjoy as compared with our own in the initial stages of the assault. It was therefore necessary to neutralize a considerable number of airfields within a radius of 150 miles of Caen. The primary object of these attacks was to destroy the aircraft repair, maintenance and servicing facilities and thereby cause the maximum interference with the operational ability of the German Air Force.

I planned that these attacks should start at least three weeks before D Day, and they actu-

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ally began on 11th May, 1944. It was necessary to bear in mind in the planning of these attacks that no indication should be given as to the selected area for the Allied landings.

From 11th May, 1944, to D Day thirty-four of the most important airfields were attacked by 3,915 aircraft dropping 6,717 tons of bombs, with the result that four airfields were placed in Category "A" and fifteen in Category "B." Twelve airfields of the second list were attacked by the Eighth Air Force with very satisfactory results.

The following categories of airfield damage were used:

Category "A."—Major installations completely destroyed; no further attacks needed.

Category "B."—Major installations severely damaged; further attacks warranted.

Category "C."—Minor damage; further attacks required.

These attacks on enemy airfields accomplished the desired object of placing the enemy under the same handicap as the Allied fighters by forcing them to operate from airfields a long way from the assault area. They were also largely responsible for the lack of enemy air interference with our landings and undoubtedly contributed much to the ineffectiveness of the German Air Force at the really critical times.

Photographic Reconnaissance

The photographic reconnaissance units of the Allied air forces were the first to begin active and direct preparation for the invasion of Europe from the West. For more than a year much vital information was accumulated which contributed very greatly to the ultimate success of the assault. The variety, complexity and, moreover, the detailed accuracy of the information gathered and assiduously collated were of great importance in the preparatory phase of the operation.

Protection of the Assembling of the Assault Forces

I stated in an earlier paragraph that one of the main tasks of the air forces was to support the landing of the Allied armies in Europe. As a corollary, the air force was required to protect the assembling of the assault forces. A.E.A.F. was directly charged with this responsibility.

More than 2,000 ships and landing craft were used to lift the initial assault forces and other equipment, and they were supported by task forces of over 100 warships including battleships and more than 200 escorts and other naval vessels. In all, over 6,000 ships and landing craft were employed in the first week.

The assembly, preparation and loading of these ships and other special beach installations necessitated the concentration of enormous forces in the ports and harbours of the south coast of England, in the Bristol Channel and in the Thames Estuary, over long periods, with especially heavy concentrations in the final six weeks. Moreover, large-scale embarkation had to be practised to ensure that speed and flexibility could be attained. To provide this practice, a series of exercises were staged in which the forces to be employed were brought into the concentration areas and in some cases embarked and sailed to practice assault beaches on the south coast of England.

Enemy Action against Assault Forces.—It was estimated by my Planning Staff that the German Air Force would have available 850 aircraft, including 450 long-range bombers to use against the Allied assault operation. I anticipated that these bomber forces would be used against shipping in ports and in transit, both in bombing attacks and in sea mining. It was further estimated that this force would be capable of the following scale of effort over a period of three weeks during the assembling and loading periods:

	Sorties.
Sustained per night	25
Intensive per night for two to three nights per week ..	50-75
Maximum in any one night ..	100-150

In fact, the enemy activity did not reach this maximum scale of effort. There were three periods of activity in the six weeks prior to 6th June, and they involved only 377 bombing sorties.

On 25th/26th April approximately forty aircraft operated against Portsmouth and Havant. On 26th/27th April, approximately eighty aircraft again attacked Portsmouth and a triangular area between the Needles, Basingstoke and Worthing. On 29th/30th April approximately thirty-five aircraft operated over and off Plymouth.

The second phase of these attacks took place on the nights of 14th/15th and 15th/16th May, when approximately 100 and eighty aircraft respectively operated against Southampton and along the coast, and against Weymouth.

The third phase was during the 28th/29th, 29th/30th and 30th/31st May; on the first of these nights approximately thirty-five aircraft attacked from Dartmouth to Start Point, and on the next two nights small forces operated indiscriminately.

The night fighter forces of the Air Defence of

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Great Britain were ready to deal with this activity. Of the total of 377 enemy sorties, night fighters claimed twenty-two destroyed, six probably destroyed and five damaged, while a further two were destroyed by anti-aircraft fire.

A valuable contribution to the defence of the assembly areas for the assault forces was made by balloons and anti-aircraft guns. Units were provided for this purpose by R.A.F. Balloon Command, the R.A.F. Regiment, Anti-Aircraft Command, and certain anti-aircraft artillery formations of the United States forces. Operational control of these units was in general exercised on my behalf by the Air Marshal Commanding Air Defence of Great Britain.

The work of these units not only in protecting the assembly but later in defence against attacks by flying bombs was of exceptional value to the launching and maintenance of the assault. I deal with certain other features of this work later in this Despatch.

It was also of the utmost importance to deny to the enemy air reconnaissance of Southern England. Special precautions had to be taken to this end.

Mastery of the air over the Channel, wrested from the enemy in earlier years by aircraft of R.A.F. Fighter Command (later Air Defence of Great Britain), had done much to ensure this end already. Daylight operations of enemy aircraft overland were almost unheard of and it was appreciated that only dire necessity would prompt the enemy to expose his aircraft and pilots to the heavy risk they would run in attempting to spy out our preparations. None the less, the enemy had now so much at stake that a great effort on his part was to be expected. To deal with possible enemy reconnaissance efforts, therefore, I directed that standing high- and low-level fighter patrols should be maintained by aircraft of Air Defence of Great Britain during daylight hours over certain coastal belts.

In the six weeks immediately prior to D Day, however, the enemy flew only 125 reconnaissance sorties in the Channel area and four sorties over the Thames Estuary and the East Coast. Very few of these sorties approached land, most of them being fleeting appearances in mid-Channel. Our fighters rarely got even a glimpse of these enemy aircraft, which could have seen very little and could only have taken back, therefore, information of very small value; but as an extra deterrent, standing patrols were maintained as far out as forty to fifty miles south of the Isle of Wight and intruder aircraft were directed to the enemy airfields in the Dinard area, from which it was believed such enemy reconnaissance aircraft as appeared were operating. In the result the enemy appears to have learnt very little.

These defensive measures, coupled with the others to which I have already referred, achieved for the assault a complete tactical surprise on D Day and did much to ensure the safety of the cross-Channel movement of the assault forces. The weather factor relating to this aspect of the operations is considered in later paragraphs.

On many days Allied air forces flew more photographic reconnaissance sorties in one day than the enemy flew in the whole of the vital period of six weeks prior to D Day. In view of the fact that the enemy was aware, in general terms, of our intention to invade the Continent, the small scale of his air reconnaissance effort is, to say the least, extraordinary.

"Crossbow" Operations

It became known early in 1943 that the enemy was preparing an attack on the United Kingdom with flying bombs and rockets launched from the French coast. Much experimental work on these projectiles had been done in the Baltic Sea area, and it was believed that the enemy would shortly be in a position to begin constructing sites from which the projectiles could be launched. Construction began chiefly in the Pas de Calais and the Cherbourg areas during the autumn of 1943.

Considerable research into the nature of these novel weapons was carried out by Operational Research Sections and by a special Committee set up in the Air Ministry, and it was concluded that they represented a potentially serious menace, both to the United Kingdom and to the preparation and build-up of forces for the projected Operation "Neptune." Accordingly, it became necessary to divert part of the available air effort to attacks on these constructional sites in order to prevent the threat becoming a reality.

The sites were given the code word of "Noball" and operations against them were carried out under the code word "Crossbow." . . .

The attacks on sites prior to D Day are listed below. At D Day it was estimated that out of ninety-seven identified flying-bomb sites, eighty-six had been neutralized, and out of seven identified rocket sites two had been neutralized.

In addition, heavy attacks were launched on several special supply or storage sites which had been observed under construction.

Statistical Summary of Preparatory Operations

The following statistics show the immense scale of the effort of the Allied air forces operating from the United Kingdom against both "Overlord" and "Pointblank" targets during the preparatory phase 1st April to 5th June, 1944. That the achievements referred to in the fore-

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Preparatory Operations
Period 1st April—5th June, 1944

Force	*Aircraft despatched*	*Tons of bombs dropped*	*Aircraft lost in combat*	*E/A destroyed in combat*
A.E.A.F.:—				
Ninth A.F.	53,784	30,657	197	189
2nd T.A.F.	28,587	6,981	133	66
A.D.G.B.	18,639		46	111
R.A.F. B.C.	24,621	87,238	557	77
U.S. Eighth A.F.:—				
VIIIth B.C.	37,804	69,857	763	724
VIIIth F.C.	31,820	647	291	1,488
	195,255	195,380	1,987	2,655
Total sorties as above			195,255	
R.A.F. Coastal Command			5,384	
			200,639	

going paragraphs were not accomplished without considerable cost in skilled man power is evident from the aircraft casualty figures included. Statistics covering personnel casualties in the preparatory period are included in the schedule in Part III (*d*).

The sorties of Coastal Command included are only those on anti-shipping and anti-U-boat patrols in the Bay of Biscay and Channel areas and off the Dutch coast. The weight of depth charges, bombs, etc., dropped and casualties or claims arising from these sorties are not included.

(c) The Assault

There was no enemy opposition to the original passage of the assault or airborne forces. This fact is all the more remarkable when it is remembered that many of the ships had, of necessity, been at sea for periods of some days.

I have set out in Section (*b*) of Part II, the tasks undertaken by the air forces in support of the assault. For convenience of presentation, these tasks have been dealt with under the five headings shown below:

Protection of the cross-Channel movement.

Neutralization of coastal and beach defences.

Protection of the beaches.

Dislocation of enemy communications and control.

Airborne operations.

The Order of Battle of A.E.A.F. as at D Day is set out at Appendix "D,"* the strength of aircraft available being as follows:

Type	*United States Forces*	*Royal Air Force*	*Grand Total*
Medium Bombers	532	88	620
Light Bombers	194	160	354
Fighters and Fighter Bombers ...	1,311	2,172	3,483
Transport Aircraft	1,166	462	1,628
Reconnaissance Aircraft ...	158	178	336
Artillery Observation Aircraft ...	—	102	102
A.S.R. (Miscellaneous)	—	96	96
Powered A/C Total	3,361	3,258	6,619
Gliders	1,619	972	2,591
Grand Total	4,980	4,230	9,210

*Maps and Appendices not reproduced.

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Protection of the Cross-Channel Movement

The task of assisting the naval forces to protect the passage of the assault armies from surface and U-boat attack was undertaken chiefly by R.A.F. Coastal Command, though aircraft of A.E.A.F. assisted in this task. I deal later with these operations in more detail. . . .

Neutralization of Coastal and Beach Defences

The task of neutralizing as many of the coastal defence positions as possible during the crucial period of the assault was shared by naval and air bombardment. The air bombardment plan called for attacks to commence just before dawn on D Day.

Protection of the Landing Beaches

In addition to the cover given to the cross-Channel movement of the assault forces, I provided a continuous daylight fighter cover of the beach-head areas. Nine squadrons in two forces of six squadrons of low cover and three squadrons of high cover continuously patrolled over the British and American beaches. A reserve of six fighter squadrons on the ground were also kept at readiness to strengthen any point if the enemy came up to challenge.

Balloon Defence of the Beach-head.—To supplement the defences provided by fighter aircraft and anti-aircraft guns, it had been decided to provide balloon protection for all beaches and artificial ports ("Mulberrys"). It was thought that balloons would give valuable protection against low-flying attacks and would permit economies in the number of light A.A. weapons that would be needed in the early stages of the assault.

In Part IV of this Despatch I give further details of some of the difficulties experienced and overcome in planning the employment of these balloons. Here I need only comment on the results achieved. The passive nature of balloon defence and the monotonous lack of results make it difficult to compute its value. There were practically no reports of low-level bombing attacks by enemy aircraft during the periods the balloons were flying, and such bombing as did occur was scattered, doing little damage to the beach maintenance and none to the "Mulberrys." One enemy aircraft was destroyed by a balloon on the beaches in the U.S. sector. Apart from the positive value of balloons as a deterrent to low-flying enemy attacks. I feel that the presence of balloons has, in itself, a definite morale value for both Naval and Army personnel.

Dislocation of Enemy Communications and Control

Air operations to dislocate enemy control of operations in the field were begun on the day before the assault. This dislocation of the enemy control went even farther than the previous attacks on his radar chain. The latter had blinded the enemy to the movement of the Allied assault forces; the air operations now proceeded to impede and disrupt in advance any possible enemy moves to make good his initial setback. To do this I tried during the initial stage of the assault, to break up the enemy machinery of control and signals communications and by so doing to make as difficult as possible the co-ordination of enemy counter-attacks. Châteaux known to house German corps and divisional headquarters and also German Army telephone exchanges were attacked on the evening of 5th June and through D Day by fighters with bombs and rocket projectiles. These operations undoubtedly seriously embarrassed the enemy, both during the assault and later, when a large number of enemy headquarters were knocked out.

The air forces also were quite successful in causing casualties among German Generals. Field-Marshal Rommel himself was fatally wounded in an air attack and it is believed that a further six to eight commanders were also casualties. The killing in an air attack of a divisional commander during a critical stage of the fighting at St. Lo is thought to have had an important effect on the course of the battle.

Airborne Operations

The general plan of the airborne operations called for the dropping and landing of three divisions of parachute and gliderborne troops, and for the initial reinforcement and resupply of these formations.

Two of these divisions were the 101st and 82nd United States Airborne Divisions and their task was to assist in the capture of the Cotentin Peninsula by aiding the seaborne landing of the First United States Army, and by preventing enemy reinforcements from moving into the peninsula from the south. The particular tasks of these divisions were to capture the areas of St. Mere Eglise and St. Martin and the neighbouring coastal defences.

The third division was the 6th British Airborne Division and its task was to operate on the left (eastern) flank of the I Corps of the Second British Army, in the area between the Orne and

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Dives rivers. The particular tasks of this division were:

(*a*) To secure intact, and hold, the two bridges over the River Orne—Caen Canal at Bonouville and Ranville.

(*b*) To neutralize an important enemy coastal battery and capture or neutralize a key strong-point.

(*c*) To secure a firm base, including bridgeheads east of the River Orne.

(*d*) To prevent enemy reinforcements (including panzer units) from moving towards the British left flank from the east and south-east.

To accomplish these objects Nos. 3 and 5 Paratroop Brigade Groups flew in with a limited number of gliders carrying details of the 6th Airborne Division Headquarters on the night of D – 1/D Day, and were followed by the 6th Air Landing Brigade on the evening of D Day.

A limited number of S.A.S. troops were dropped in selected areas before and after D Day for special missions, by aircraft of No. 38 Group.

The airlift of all these forces was provided by the transport aircraft of A.E.A.F. United States 9th Troop Carrier Command carried the American divisions, and Nos. 38 and 46 Groups of the Royal Air Force carried the British force.

U.S. 9th Troop Carrier Command.—The paratroops of the 101st Division were dropped by aircraft of the United States 9th Troop Carrier Command in the general area of St. Mere Eglise shortly after midnight on the night of 5th/6th June (Operation "Albany"). The glider force of the 101st Division went in at dawn of D Day into the same area, in fifty-eight gliders (Operation "Chicago"). A resupply mission was flown for the 101st Division on the night of D+1 (Operation "Keokuk"). This resupply mission was necessary, as there had been no contact between the 101st Division and the seaborne assaulting forces.

Paratroops of the 82nd Division were flown in in aircraft of 9th Troop Carrier Command and dropped in the general area of St. Sauveur le Vicomte (Operation "Boston") shortly after midnight of 5th/6th June. Glider elements of this division were flown in as follows:

Fifty-two gliders at dawn of D Day (Operation "Detroit").

One hundred and seventy-seven gliders at dusk of D Day (Operation "Elmira").

Ninety-eight gliders at dawn of D+1 (Operation "Galveston").

One hundred and one gliders at dusk of D+1 (Operation "Hackensack").

Resupply missions for the 82nd Division were flown on the nights of D+1 and D+2 with 148 and 117 aircraft respectively, carrying a total of approximately 432 tons of supplies (Operations "Freeport" and "Memphis").

Nos. 38 and 46 Groups, Royal Air Force.—The tasks of these groups were as follows:

(*a*) Dropping of S.A.S. troops—

(i) D – 1/D Day: reconnaissance parties to be dropped in each of six areas (Operation "Sunflower I").

(ii) D+½: dropping of task forces in Brittany (Operation "Coney").

(iii) D+¾: dropping of base parties in the six areas mentioned above (Operation "Sunflower II").

(iv) Resupply to base parties as required (Operation "Sunflower III").

(*b*) Dropping and landing of Nos. 3 and 5 Paratroop Brigade Groups plus a proportion of divisional troops on the night of D – 1/D Day (Operation "Tonga").

(*c*) Landing of the 6th Air Landing Brigade on the evening of D Day (Operation "Mallard").

(*d*) Resupply of Nos. 3 and 5 Paratroop Brigade Groups on the night of D/D+1 (Operation "Robroy I").

(*e*) Subsequent resupply mission for the 6th British Airborne Division (Operation "Robroy II," III, etc.).

All these operations were carried out successfully, and with a remarkably low casualty rate, as will be evident from the statistics which follow. Total losses amounted to 3½ per cent. and 2½ per cent. respectively of the British and American sorties flown.

These airborne operations constituted the greatest airlift of assault forces that had ever been attempted. Up to date they are exceeded only by the immense operations of the First Allied Airborne Army in mid-September. The accuracy with which these forces were delivered to the allotted zones contributed greatly to the rapid success of their *coups de main*.

Provision of Air Support.—All the airborne forces and resupply missions which were flown in daylight were given adequate fighter cover; in addition, the fighter cover to the assault areas and reserves were held in readiness to assist in the protection of these forces. There were no losses due to attack by enemy aircraft on any formation of troop carriers.

(d) Operations subsequent to D Day

Plan of Presentation

As in the previous sections of the narrative part of this Despatch, I propose to deal with the operations in the period D Day to 30th Septem-

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ber, 1944, under types of operations, rather than on a time basis. For this purpose the following headings have been adopted:

Attacks on Enemy Communications.
Close-support Operations.
Attacks on Coastal Garrisons.
Fighter Cover to the Assault and the Shipping Lanes.
Enemy Air Reaction and the Allied Attacks on the German Air Force and its Bases.
Defence against Flying Bombs and Attacks on "Crossbow" Targets.
Operations of First Allied Airborne Army.
Attacks on Naval Targets.
Strategical Bombing—"Pointblank."

Attacks on Enemy Communications

I have dealt with the task undertaken by the air forces of dislocating, prior to D Day, the enemy rail system. I considered that one of the most important contributions which the air could make to the ground battle, after the launching of the assault, was to continue this work of dislocation. With this view you agreed, as did the other Commanders-in-Chief.

The interruption of enemy communications during the post-assault phase falls naturally into two separate periods:

(*a*) From the moment the contending armies had joined battle, it became of paramount importance that the enemy should be denied the freedom of movement necessary to prepare and mount successful counter-attacks, and that the reinforcements he sought to bring into the battle zone should not only be hampered in movement but also subjected to the severest casualties possible by air attack.

(*b*) After the break-through of the Allied armies, the task of the air forces against communications was to harry the fleeing enemy columns, block the defiles and police the river crossings, thereby removing the possibility of orderly retreat.

In the following paragraphs I try to show how these two tasks were carried out.

As the period of static fighting ended and the Allied armies broke out from their bridgehead, I called off the attacks on rail targets, as they were then more likely to hamper than help the Allied advance.

Attacks on Bridges, June and July.—The destruction of the bridges leading into the battle zone was also continued after the assault was launched. These attacks, as I have already explained, formed part of the general plan of attack on the enemy's transport system. At D Day all the Seine bridges below Paris except two were cut. During June these two were destroyed as well as the principal bridges, both road and rail, across the Loire. Several important bridges on the lines through the gap between Paris and Orleans were also rendered impassable. The map* indicates the ring thus drawn about the battle area.

Briefly, this ring ran along the Seine and Loire. A second line of interdiction further afield had been planned, and to this end a large number of the more important bridges in the rail systems of North-Western France and Belgium were also cut; in addition, a number of minor bridges within the tactical area were rendered impassable.

In fact, however, this second line of interdiction was never completed. There were several reasons. Chief amongst them was the weather, which curtailed operations. Next were the priority claims on the fighter-bombers of the United States Eighth Fighter Command. Finally, there came a time when, because of the speed of our advance, further destruction of bridges was no longer necessary and, indeed, would have been to our disadvantage. At this time I sought and secured your agreement, and that of the two Army Group Commanders-in-Chief, to stop these attacks.

Effect of Attacks on Communications.—The enemy endeavoured to overcome the restrictions the air attacks placed on him by moving his stores and equipment both by road and by barges down the Seine from the unloading points near Paris to the ferries he had established at Elbeuf and in the neighbourhood of Rouen, as well as along the waterways of Northern France. Both of these channels were dealt with by air attack, and there is a large amount of intelligence material to testify to the effectiveness of these fighter-bomber attacks. Prisoners of war have confirmed pilots' stories of losses and have told of divisions moving very long distances by bicycle and being committed to the land battle piecemeal, without heavy equipment, as a result of Allied air attacks.

Effect of Weather on Operations.—It is clear, I believe, from the foregoing paragraphs that the Allied air forces succeeded in crippling one of the most dense and complex networks of railways and roads in the world, and in practically denying its use to the enemy. I must emphasize, however, the influence which bad weather had on these operations. Both heavy and medium

*Maps not reproduced.

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bombers, because of this bad weather, were prevented time and again from taking part in planned attacks on railways and bridges. We needed weather consistently good enough to permit precision visual bombing in density and co-ordinated attacks of a type most appropriate, as regards aircraft and weapons, to the targets involved throughout the whole of this period. I am convinced that if we had had this weather the enemy would have been prevented from moving by rail at all, and his retreat, disastrous as it was for him, would have been virtually impossible and far more costly in casualties to personnel and equipment than it was.

Attacks on Communications, August and September.—The second phase of attacks on communications began when the enemy tried to get away, and this became almost entirely a fighter and fighter-bomber war. Forced to move by day as well as by night to escape the encircling ground forces, the enemy was constantly harried and destroyed. The roads leading to the Seine, then the Seine crossings, pontoons and barges, and finally the roads of Northern France, were in turn successfully attacked and became littered with the skeletons of the German Army's transport and equipment.

Value of Reconnaissance.—I cannot stress too strongly the importance of reconnaissance in planning attacks on communications. Although inclement weather interfered with the programmes for both photographic and visual reconnaissances, I was generally well informed of the moves of enemy supplies and reinforcements and was able to deal with them before they reached the battle zone. The valuable information brought back also enabled the Army Commanders to make accurate forecasts of the enemy strength and intentions. This position became completely reversed when the Allied armies moved forward. There is evidence to show that, because the Allied fighters kept the German Air Force reconnaissance down to a negligible effort, the German High Command was fighting completely in the dark, unaware of the Allied intentions or of the strength and direction of each thrust.

Close Support Operations

In addition to the contribution made to the success of the land battle by attacks on the enemy's communications, the air forces gave direct support to the Allied armies. These operations were laid on in three ways:

(*a*) Armed reconnaissance.
(*b*) Prearranged support.
(*c*) Immediate tactical support.

The armed reconnaissances were made by fighter-bomber aircraft, which with bombs, R.P. and cannon fire attacked a variety of targets, particularly movement seen on roads or railways. The prearranged support was of two kinds —attacks made according to plans prepared some time in advance and which included heavy and medium bombers; and, secondly, the more normal form of attacks laid on as a result of conferences between Army and Air staff in the field, when tactical targets for the ensuing day were decided upon. For these attacks the Army usually undertook to assist the bombers by marking the target by means of smoke signals. Immediate support was provided in the usual way by strike aircraft held in readiness to attack targets requested direct by Army forward positions, or reported by reconnaissance aircraft.

Prearranged Support using Heavy Bombers.—The use of heavy bombers in close support to ground forces was an important development in air warfare. A word on the situation prior to the employment of heavy bombers in such a role will not, therefore, be out of place.

The initial impetus of the Allied assault had secured a bridgehead extending from the Cotentin Peninsula to Caen, but the enemy had been able to concentrate against this relatively short front. He held strong, well-sited defence positions in depth. By stealth, ingenuity and taking advantage of frequent periods of bad weather which made air policing of road and rail in the tactical area impossible, he managed to muster just sufficient reinforcements and warlike supplies to maintain his position.

Concentrations of artillery had not succeeded in cracking his defences sufficiently to enable a successful break-through to be made without, it was considered, a prohibitive cost in both men and material. A stalemate appeared to have arisen.

Neither could an air bombardment sufficiently heavy and concentrated to produce a situation ripe for a successful ground attack be provided by medium, light and fighter-bombers.

I had already submitted to you a study of the situation in which I had made suggestions as to how the air forces could help the land forces to break out of the Normandy bridgehead. After consideration of this study by the various Commands (both land and air) concerned, it was decided to use heavy bombers in the virtually novel role of Army co-operation.

The detailed plans for these attacks were worked out at an inter-Service level, being finally co-ordinated at your headquarters. The co-ordination of the actual operations of the air

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forces involved in the attacks, however, was exercised by me.

The first of the large-scale attacks, using heavy bombers in close support took place at 0430 hrs. on 8th July. R.A.F. Bomber Command employed 467 bombers to drop 2,562 tons of bombs on positions north of Caen. The British and Canadian troops, held up to the north of the town for so long by the enemy, followed up the bombing with a frontal attack. By nightfall they had entered the streets of Caen. The bombing had therefore succeeded in its object and had opened a way for a break-through by the ground forces.

The second, and largest, of these operations (Operation "Goodwood") took place on 18th July, when the combined weight of the United States Eighth Air Force, Royal Air Force Bomber Command and the Allied Expeditionary Air Force supported an advance by elements of the Second British Army in the Caen area.

This attack was the heaviest and most concentrated air attack in support of ground forces ever attempted. No fewer than 1,676 heavy bombers and 343 medium and light bombers were committed to the attack and the total tonnage of bombs dropped reached 7,700 U.S. tons.

The other four attacks by heavy bombers were generally based on the same principle of destroying the enemy strong-points, and cratering given areas to prevent the enemy from attacking the flanks of our forces while they were advancing through the swept but relatively undamaged centre of the assault area.

The third of the large-scale attacks involving heavy bombers was launched on 25th July, when 1,495 heavy bombers and 388 fighter-bombers of the United States Eighth and Ninth Air Forces dropped 4,790 tons of bombs in a bombardment preliminary to an advance by elements of the First United States Army across the Periers—St. Lo highway. Unfortunately some of the bombs in this attack fell short and caused some casualties to our own ground forces in the area.

The fourth attack was in support of the Second British Army south of Caumont. The preliminary heavy air bombardment was launched early on 30th July and 693 heavy bombers of R.A.F. Bomber Command and over 500 light and medium bombers of A.E.A.F. dropped 2,227 tons of bombs.

The fifth attack assisted the advance of the First Canadian Army along the Caen—Falaise road on the night of 7th/8th August and during the succeeding day. One thousand four hundred and fifty heavy bombers of the United States Eighth Air Force and of R.A.F. Bomber Command, and fighter-bombers of the Second Tactical Air Force dropped 5,210 tons of bombs on enemy installations, strong-points and forces in the area of the advance.

The sixth attack, also by R.A.F. Bomber Command, took place on the morning of 14th August and assisted the Canadian forces to advance into Falaise. Eight hundred and eleven bombers were employed and 3,723 tons of bombs were dropped in the attack. Again, in this operation, some of the bombs fell short of the targets, causing casualties to our own ground forces.

In each case the ground forces were able to move into the bombarded positions practically without opposition. That they failed to exploit fully the break-through is known, but there are doubtless many reasons for this failure. In the second attack the principal cause of delay was the bottleneck across the Caen bridges which delayed the moving of armoured formations sufficiently long to enable the enemy to remount his screen of guns outside the area which had been bombed. In the third attack the Army Commander agreed that the "carpet" bombing did put his troops through the enemy positions; difficulties which arose in moving the Army forces forward as rapidly as was necessary again prevented a complete exploitation. Nevertheless, these heavy attacks did finally succeed in starting off the break-through of the ground forces across the Periers—St. Lo highway, and it was this break-through which eventually determined the Battle of Normandy, which liberated France.

I have referred to the lessons learned from this series of attacks in close support in Part V of this Despatch. From an air point of view the attacks definitely proved that saturation bombing by heavy bombers on a narrow front can enable an army to break through, but they also showed the need for the Army to exploit, without delay, the favourable situation created. Further, the heartening moral effect of these large-scale air support formations on our own forces and the corresponding shattering of the will to resist among the enemy has been stated by Army Commanders to have been of vital consequence. Air and land action must be closely co-ordinated. The land forces must be ready to step off at least immediately the bombing is over, if not just before, accepting some slight risk of casualties from our bombing, and the artillery programme must be directly related to the bombing plan to ensure economy of effort by both arms.

Prearranged Close Support by Medium and Fighter-Bombers.—The operation of medium and fighter-bombers on prearranged support was often in small formations against targets such as gun positions, tank laagers, châteaux suspected of housing headquarters formations, and defended positions. . . .

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Immediate Support.—The immediate support of the armies was provided by the fighter-bombers of the tactical air forces and in this role the fighter-bombers have shown their greatest effectiveness. Never before have they been used in such strength and with such decisive results. I have divided my review of their operations in the following paragraphs into four phases of the land battle, as follows:

(i) The period of static fighting.
(ii) The break-through of the Allied armies.
(iii) The period of encirclement.
(iv) The retreat across Northern France and Belgium.

In the early period of the operations of offensive fighter and fighter-bomber forces the co-operation between the Commander of the United States 9th Tactical Air Command, General Quesada, and the Air Officer Commanding No. 83 Group, Royal Air Force, Air Vice-Marshal Broadhurst, C.B., D.S.O., D.F.C., A.F.C., was close and effective. Each gave the other assistance as the occasion arose and whenever a good target presented itself neither hesitated to call on the other to take advantage of it. The development of common methods of control and target indication and reference greatly assisted this British and United States mutual support.

Attacks on Coastal Garrisons

During the last week in August and through September, strong bomber forces were used to reduce the enemy garrisons holding on to the Atlantic and Channel ports. The attacks on Brest between 24th August and 6th September were shared by the United States Eighth and Ninth Air Forces and R.A.F. Bomber Command. More than 6,000 tons of bombs were dropped on the garrisons of this city. The attacks on Le Havre, Boulogne and Calais were R.A.F. Bomber Command operations, and provided excellent examples of reduction of a town by air bombing. This was especially so in the case of Le Havre. The Allied casualties in the subsequent assault against a strongly fortified garrison of 11,000 defenders totalled only 400. Between 1st and 12th September 2,042 sorties were flown against Le Havre alone and 11,000 tons of bombs were dropped 5,000 tons of this total being aimed in one massive daylight attack on an extremely small area.

This bombing was undertaken at the express wish of the Army Commanders and undoubtedly it succeeded in paving the way for and in saving the lives of thousands of our soldiers in the final assault. It must be recorded, however, that casualties to French civilians shut up with the German garrisons in these ports were inevitably high, particularly so at Le Havre. I feel that in the broad view this bombing effort would have been more profitably directed against targets inside Germany, particularly as the disorganization of her retreating army was most acute at this time. I should have been happier to see it used against focal points in the communications system behind the enemy frontier, in an effort to delay the movement of reinforcements with which the enemy succeeded, in mid-September, in stabilizing a line along the Rhine and the Moselle.

It must also be remembered that the bombing had to be laid on to suit the Army plan, and in consequence it was sometimes delayed or postponed because the Army could not always be ready to attack at the agreed time or because of unfavourable weather conditions over the target. Bad weather over the target areas coincided sometimes with good weather over Germany. Because the heavy bombers had been committed to, and were standing by for, attacks on the garrison towns, opportunities for using them in good conditions against vital industrial targets in Germany were lost.

Operation "Market"—First Allied Airborne Army

On 17th September, airborne forces of the First Allied Airborne Army, comprising United States 82nd and 101st Airborne Divisions, 1st British Airborne Division and a Polish Parachute Brigade, were dropped and landed in the Eindhoven—Nijmegen—Arnhem areas of Holland. The lift of these airborne forces exceeded that made during the initial landings on the Continent. The operation was designed to facilitate an advance by the northern group of armies up to and over the Rivers Waal and Lower Rhine. With this end in view, the chief objectives of the airborne troops were the bridges at Arnhem and Nijmegen.

The initial drops were successful, being carried out accurately and with very few casualties. During the subsequent nine days, as weather permitted, reinforcements and supplies were flown in to the airborne troops and to the supporting ground troops who had linked up with them. Despite an heroic struggle by the troops of the 1st British Airborne Division the bridge at Arnhem, although secured initially, could not be retained. The bridge at Nijmegen, however, was secured and the operation paved the way for a subsequent advance up to the River Waal and beyond. It provided many lessons for the future and marked a definite step in the evolution of airborne operations.

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Strategical Bombing—"Pointblank"

In addition to their priority operations, already described, against targets in the tactical area and against flying-bomb installations, the United States and British strategical air forces maintained a considerable effort against targets within Germany after D Day. As these operations were not directed by me, I mention them very briefly and in order simply to round off the story of the Allied air effort.

The chief limitation on their effort was the weather, which frequently made it necessary to cancel projected attacks. The main weight of this offensive from June to September was directed against the enemy's oil supplies and oil-production centres. These targets were given priority over aircraft-production and assembly plants (although attacks on these latter were not entirely suspended) and other industrial objectives as being, at this time, of more critical importance to the enemy. The German Air Force had, by D Day, been very seriously weakened by the efforts already directed against it, although the deep-penetration daylight raids of the United States Eighth Air Force still provoked violent enemy air reaction on most occasions. In consequence there was a steady attrition of the German Air Force in aerial combat as well as a depletion of Germany's oil resources. Heavy and concentrated attacks on these targets have produced an oil situation which, taken with the loss of Rumanian supplies, must be seriously worrying the German High Command. The influence of this situation is already being, and will be increasingly, felt on the battlefield.

Other operations against "Pointblank" targets included attacks on aircraft and motor transport manufacturing centres, on several important communication centres and on German cities.

Brief Summary of Air Effort for the period D Day to 30th September, 1944

At 30th September the Allied armies stood on, and in some places over, the borders of the Reich proper. In 117 days since the assault began France, Belgium, Luxembourg and a large part of Holland had been liberated. These 117 days had also been unprecedented in the scale of air effort employed. The aircraft of A.E.A.F. alone had flown 316,248 sorties, an average of 2,703 per day. The effort of the strategical air forces based in the United Kingdom raised this total to 552,197 sorties, an average of 4,719 per day.

The remarkable achievement of such a high rate of effort is due in no small measure both to the detailed administrative plans which facilitated the transfer of forces to Continental airfields without interruption to the current operations, and to the work of the ground staffs who supplied, serviced and armed the aircraft and provided the ancillary services.

Weather.—The weather throughout the whole period was frequently unfavourable for air operations, and on many occasions interfered greatly with my plans. This was especially so in the first days of the assault. Before D Day it was known that unsettled weather was approaching and there was a distinct possibility that the unsettled period might be prolonged and severe. I was, however, confident of the ability of the air forces to carry out their allotted tasks, and in particular to deal with the German Air Force, despite the weather handicap. In the event, just after D Day, the weather was nearly as bad as it possibly could be.

In making the assault, despite the bad weather, there is no doubt that the invasion forces won an increased chance of tactical surprise. There is the evidence of a captured senior German meteorological officer that the Germans were in fact off their guard; he has stated that he advised the German Command that owing to the approach of unsettled conditions no assault would be attempted.

The following figures show the effect of the weather on air operations during the period. The A.E.A.F. total of aircraft sorties on D Day was 7,672, on D+1 8,283, on D+2, when the weather began to deteriorate, 5,073, and on D+3 the total reached 662 only. On one other day in June the total was less than 1,000, and on two further days it was under 2,000 sorties; however, despite this handicap, the average number of sorties per day for A.E.A.F. aircraft throughout the month of June was almost 4,000. Weather also affected the planning and carrying out of bomber operations between D Day and 30th September. In fact, the lack of weather good enough to permit of high-altitude precision and, above all, visual bombing was one of the chief reasons why the start of the attacks on the enemy's transportation and communications system was planned so early.

Personnel Casualties.—The following statistics of personnel casualties cover the period from 1st April to 30th September, 1944. These figures reveal a grievous loss of highly trained men. Reference, however, to the statistics in an earlier paragraph dealing with the preparatory period, and another paragraph covering the period from D Day to 30th September will show that the overall losses per sorties flown are reasonably low.

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Personnel Casualties of Allied Air Forces Operating in Western Europe
Period 1st April-30th September, 1944

	Killed in Action or Died of Wounds	*Missing and P.O.W.*	*Wounded*
A.E.A.F.:—			
U.S. Personnel	216	1,839	660
British Personnel ...	694	1,361	864
R.A.F. Bomber Command	2,318	9,265	1,109
U.S. Eighth Air Force:—			
Bomber	931	15,057	1,716
Fighter	49	959	77
R.A.F. Coastal Cammand	352	597	239
	4,560	29,078	4,665

PART IV.—SPECIAL FEATURES

The mounting of air operations of the complexity and scale recorded in this Despatch was only made possible by an adequate ground organization. I wish therefore in this section to pay some tribute to the background work against which these operations were carried out and upon which they depended for success.

For convenience, comments on some of the special features have been arranged under the following headings:

(i) Administration.
(ii) Airfield Construction.
(iii) Air-Sea Rescue.
(iv) Air Transport and Evacuation of Casualties.
(v) Employment of Balloons.
(vi) Provision of Maps.
(vii) Signal Communications and Radar Cover.

Administration

An idea of some of the special problems met and overcome by the administrative and other ground staffs is given in the following paragraphs.

On 16th November, 1943, the British forces, Second Tactical Air Force and Nos. 38 and 85 Groups had been built up to about 35 per cent. only of their final strength. The United States Ninth Air Force at this time was only approximately 25 per cent. of its final strength. To develop these forces in the winter and following spring and to have them suitably deployed in readiness for the opening of the campaign was a race against time which involved, *inter alia*:

(i) A comprehensive plan whereby aerodromes and landing grounds in the South of England were progressively evacuated by units not participating directly in "Overlord" and occupied by "Overlord" forces as the U.S.A.A.F. arrived from overseas and by the British forces as they were augmented.

(ii) Providing Second Tactical Air Force with a fully mobile organization for repair, and for the supply of Royal Air Force equipment, in substitution for the service normally provided by the Royal Air Force Maintenance Command in the United Kingdom.

(iii) Integrating the U.S.A.A.F. and R.A.F. administrative services where necessary.

(iv) Re-equipping 110 Royal Air Force squadrons with the most up-to-date types of aircraft.

(v) Changing Second Tactical Air Force from the home system of personnel administration and accounting to the overseas systems, including the establishment of a Base Personnel Staff Office and a Base Accounts Office.

(vi) On D Day the British totalled approximately 232,000 personnel and the Americans 181,000. The organization of the British part of the force alone involved the formulation and issue of some 250 new type establishments.

After D Day the principal administrative tasks to be executed and for which full preparations had been made were:

(i) By means of the inter-Allied and inter-Service machinery known as BUCO and MOVCO to control the transfer of air forces to the Continent, together with the stores for immediate use, and to build up reserves.

(ii) Special arrangements to ensure that squadrons could operate at full effort, whether from the United Kingdom or the Continent, even though their normal maintenance organization was in process of transfer.

(iii) Arrangements by which United States air forces could rearm and refuel at British airstrips and vice versa.

(iv) Rapid replacement of personnel casualties, aircraft and equipment.

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(v) The institution, quite early in the operations, of arrangements for salvaging aircraft carcasses and certain other equipment, and for returning this material quickly to the United Kingdom by L.C.T. for use by the production organization there.

(vi) Finally, maintaining a high state of mobility for the tactical air forces which were taxed to the limit to keep up with the advance.

Air-Sea Rescue

Air Defence of Great Britain and Royal Air Force Coastal Command provided the aircraft for searches in the battle area and for the forces engaged in Operation "Neptune."

Statistics of Personnel Rescued.—The following figures show the totals of personnel rescued by the Air-Sea Rescue Services of A.D.G.B. and R.A.F. Coastal Command for the period 6th June to 30th September, 1944:

June	685
July	313
August	247
September	600
	1,845

It will be seen from the above data that the Air-Sea Rescue services succeeded in rescuing many hundreds of valuable personnel, including aircrew and airborne troops. Without this organization, the great majority, if not all, of these airmen and soldiers would have perished. Even more important, perhaps, than this direct saving of life has been the moral effect which the existence and known successes of the Air-Sea Rescue Service have had, particularly on aircrews. The value of such effect in air operations is obviously incalculable, but that it is of the greatest significance there can be no doubt.

Air Transport and Evacuation of Casualties

In addition to the operational flying to carry airborne troops and supplies to their dropping and landing zones, the aircraft of the transport forces have flown many thousands of sorties on supply and evacuation missions.

The variety of equipment carried in these operations was extremely wide. It included jeeps, trailers, radar equipment, picks and shovels, propellers and shafts, explosives, mines, petrol, containers, barbed wire, magazines, books, comforts and medical stores, including blood plasma and penicillin.

Transport aircraft returning from the Continent were utilized to the fullest extent for the evacuation of the sick and wounded. This was in accordance with my policy that although no additional special ambulance squadrons should be formed, or aircraft specially tied up for air ambulance work, the maximum use should be made of all aircraft returning to the United Kingdom after delivering supplies. This policy was naturally not always popular with the medical authorities, but no relaxation of it was found to be necessary save in conditions of extreme urgency. This policy was fully supported by you. In all, during the period from D Day to 30th September, 107,115 medical cases were evacuated by air from forward positions.

The success of this work reflects great credit on all concerned—the doctors, nurses, nursing orderlies, stretcher-bearers, aircrew and ambulance drivers. In view of the fact that the aircraft often operated from airfields within range of enemy shellfire it is a remarkable fact that every evacuation from the Continent by air during the period covered by this Despatch was carried out without mishap either to aircraft, aircrew or wounded.

When the advance of the Allied armies began to outrun the normal supply arrangements, special air supply services had to be instituted. In the critical twenty-five-day period from 9th August to 3rd September no less than 13,000 tons of supplies were flown to forward positions. Furthermore, during the full month of September more than 10,000 sorties were flown and a total of nearly 30,000 tons of supplies carried. These supplies comprised principally petrol, ammunition and rations and occupied all and more than all of the available lift of the transport groups.

It was decided, therefore, to allocate special forces of heavy bombers, both of the United States Eighth Air Force and R.A.F. Bomber Command, to provide additional lift. This increased lift enabled enough fuel to be taken forward to keep the armies moving.

I feel that in certain cases air supply is an overriding consideration. This was an appropriate instance. However, the diversion of valuable specialized aircraft and crews from their proper operational tasks needs very grave justification and only vital emergencies such as had occurred at this time can warrant this action.

The principal lesson so far learnt from the campaign is that the tactical use of air transport to supply a rapidly advancing army can be of decisive importance, and that the limiting factor in its employment is not so much the availability of suitable aircraft as the availability of sufficient landing strips in the forward area and adequate loading and reloading arrangements at the terminus. These forward strips are primarily constructed and earmarked for the fighter squadrons

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operating in support of the ground forces, and their use by transport aircraft is inevitably detrimental to these operations. I therefore consider that in any future campaign the airfield construction programme should envisage the immediate provision of at least one air transport landing strip per army and that these landing strips should be constructed so as to be capable of handling a minimum of fifty to sixty aircraft per hour.

In order to minimize the influence of the weather factor, consideration should also be given to the launching of air supply missions from forward airfields in close liaison with and, where necessary, under the local tactical air command.

MATERIAL REQUIRED FOR HISTORY OF R.A.F. REGIMENT

Serving or ex-Service members of the R.A.F. Regiment or of R.A.F. ground defence force units are invited to send to the Head of the Air Historical Branch (A.H.B.1, R.A.F. Regiment) Air Ministry, Whitehall, London, S.W.1, details of any action or event personally experienced or witnessed which illustrates the work and spirit of the ground defence units and of the R.A.F. Regiment during the war.

The information is required for the preparation of a history of the ground defence of airfields and other R.A.F. establishments at home and overseas from 1939, and of the activities of the R.A.F. Regiment since its formation.

NEW FLAG REGULATIONS FOR THE R.A.F.

All R.A.F. aircraft will in future fly the Royal Standard when carrying the King, according to a new Air Ministry order. The appropriate standards will also be flown when Service aircraft carry certain other members of the Royal Family and the personal flag of the Secretary of State for Air when he is a passenger. The R.A.F. ensign will be flown for the heads of foreign states, various dignataries of the United Kingdom, the Dominions, the Colonies, including the Prime Ministers, and (as far as the U.K. is concerned) Cabinet ministers, together with the Commanders-in-Chief of the three Services.

The flags are mounted on a flag staff in socket above the pilot's cockpit and flown when the aircraft is at rest during the time that the passenger concerned is in the immediate vicinity. The flag is, of course, stowed before take-off. Formerly the only flag flown by Service aircraft was the R.A.F. ensign—by flying-boats of Coastal Command when moored. The new regulations were approved by the King in time for the South Africa tour, when Viking aircraft of the King's Flight carried the Royal Standard for the first time.

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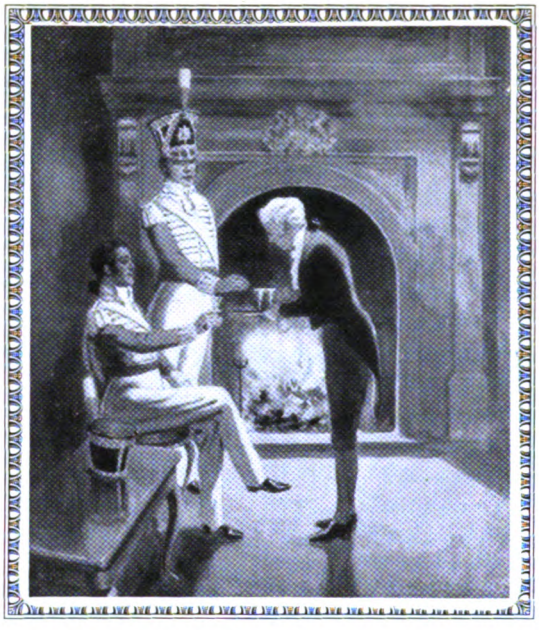

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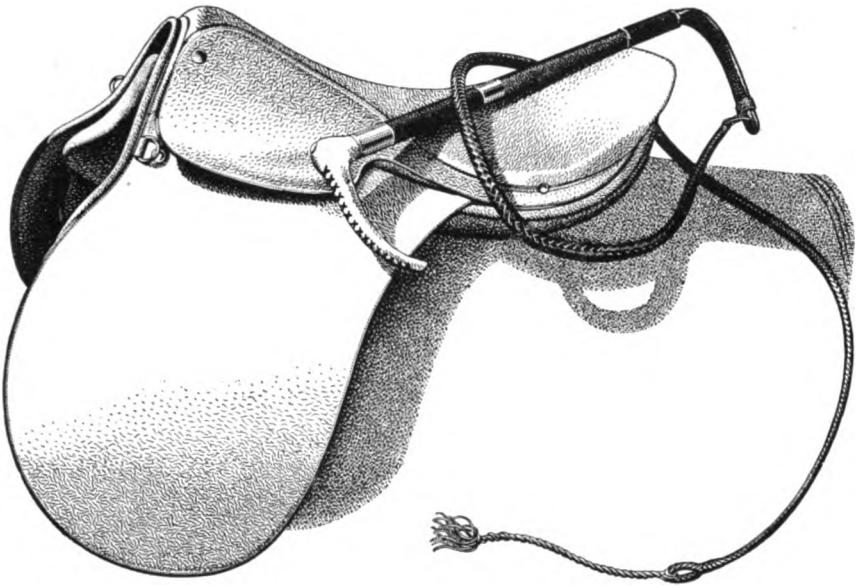

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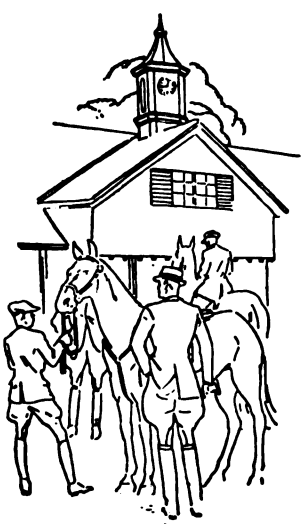

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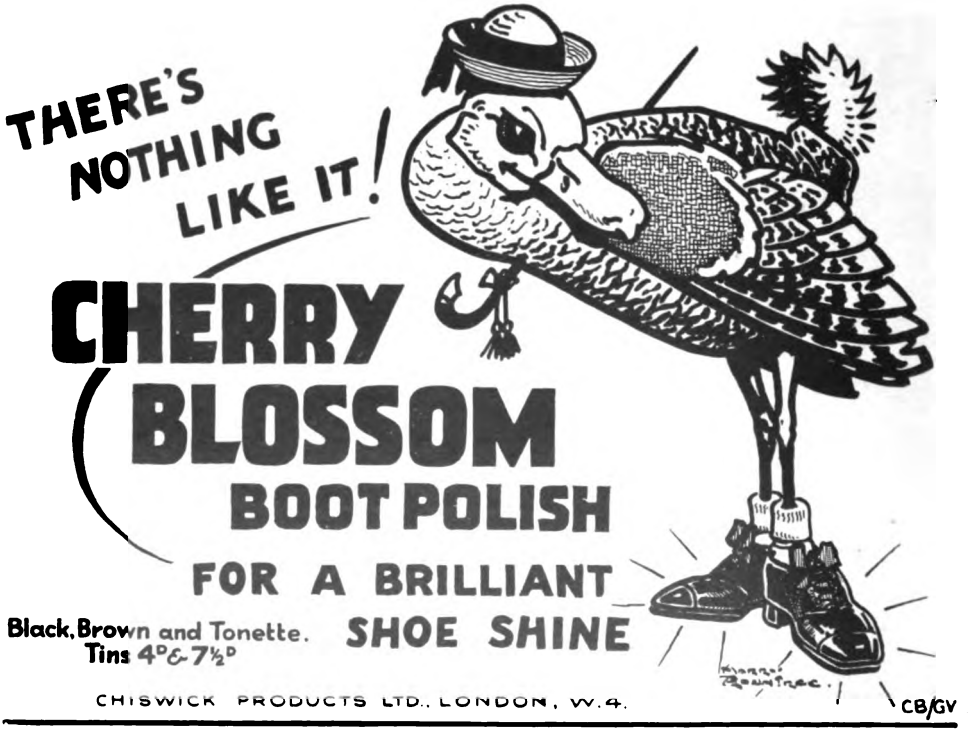
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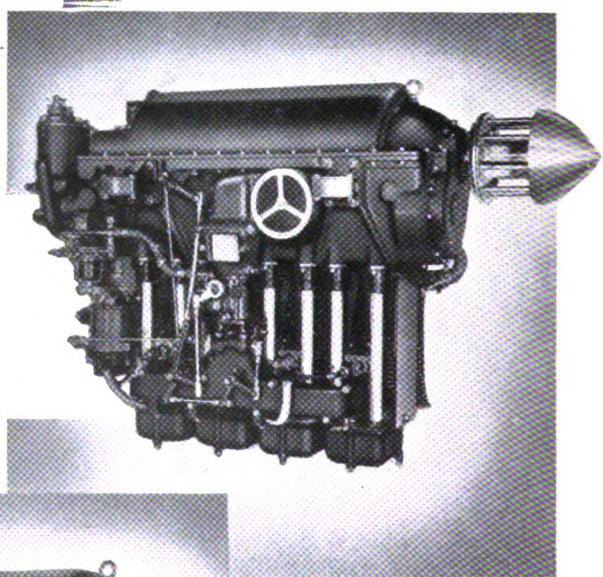

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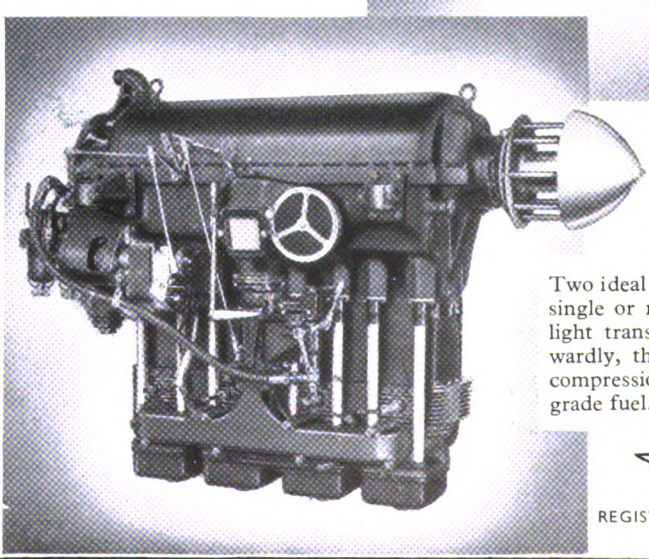

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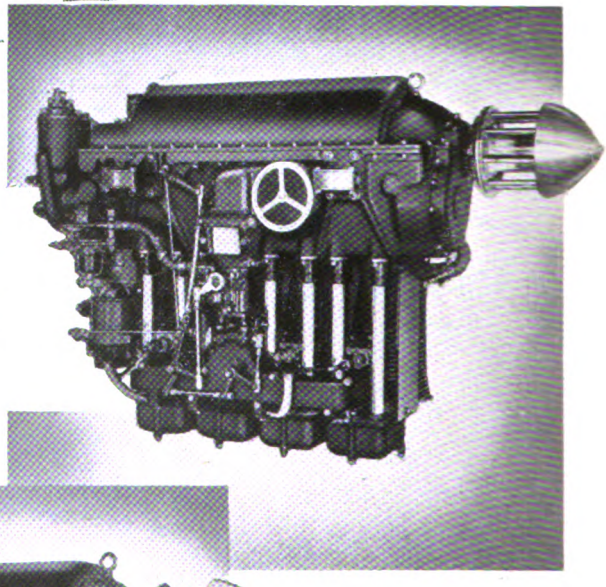

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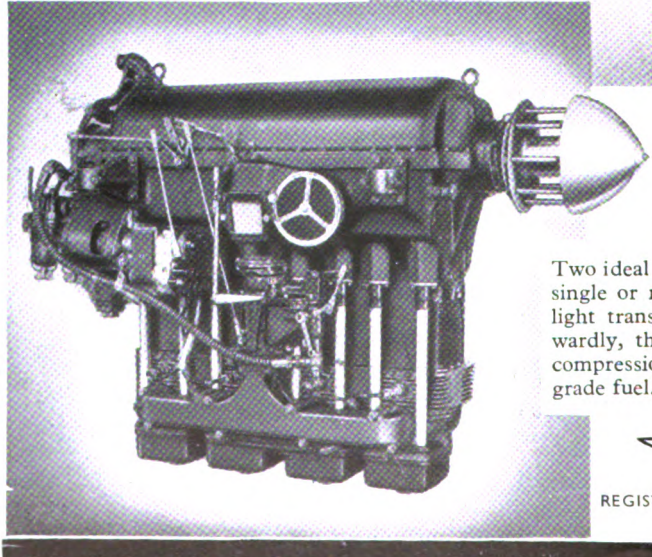

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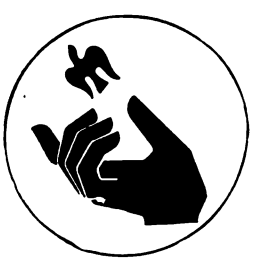

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NOTICES

ARMY, NAVY, MARINES AND AIR FORCE PROVIDENT SOCIETY

ESTABLISHED IN 1889

An Association of Officers who mutually provide benefits for their families at minimum cost

Object of the Society.—To afford to officers a means whereby they may, at a minimum cost, provide annuities for their widows (or their eligible children if their wives predecease them) which may prove a welcome addition to the small Service pensions.

Membership.—All regular officers (serving or retired) of the Royal Navy, Army, Royal Marines, Royal Air Force or Royal Indian Navy are eligible for membership provided they are under 50 years of age. No special conditions or rates of contributions are claimed to cover flying risks.

Contributions and Benefits.—The annual contribution depends upon the number of memberships held and the relative ages of the member and his wife. An annuity is paid to the widow of an officer who has held memberships for not less than six years.

Number of Memberships Allowed and Amount of Contributions For Each.—An officer may take up one, two, three or four memberships, each of which will be distinct as regards contribution and benefits. For each membership the annual contribution is £2, plus a disparity fee of 2s. 6d. for each year, and part of a year, that his wife is younger than the member. (Relief from one half of the standard rate of income tax may be claimed in respect of the contributions.)

Antedate of Membership.—Normally a membership dates from 1st April preceding the date on which it is taken up. It may, however, be antedated by one or two years, if, in addition to the contribution for that year, or those years, an extra sum of 1s. 6d. for each £1 of contribution, in the case of one year of antedate, or 4s 6d. for each £1 in the case of two years of antedate, be paid.

Annuities.—When memberships have been held for six years the member's widow becomes entitled to an annuity at his death. The amount of this annuity depends upon the state of the funds and the number of years the membership (or memberships) has been held. If the member dies after completing six, and before completing seven, years of membership the annuity is, at present, £2 10s. for each membership (£10 for four memberships). Normally from each subsequent year of membership completed an addition of 10s. per membership (£2 for four memberships) is made up to a maximum of £13 per membership (£52 for four memberships).

If the member dies before completing six years of membership, the whole of his contributions are refunded to his widow (or eligible children).

Eligible Children.—If the member leaves no widow the accrued annuity is paid to his eligible children, *viz.*,

(*a*) Unmarried daughters under 21 and unmarried sons under 18 years of age.

(*b*) Afflicted sons or daughters of any age for a period equal to what would have been the expectation of life of their mother, had she survived the member.

Cessation of Contribution in Certain Cases.—A member of 55, or more, years, of age who has held membership for ten, or more, years may be relieved from further contributions (except 5s. a year) in consideration of the annuity payable to his widow being reduced by a suitable amount according to the difference between the ages of himself and his wife.

Refund of Contributions in Certain Cases.—If a member's circumstances become such that he cannot continue his membership, he may be allowed to withdraw and receive back a portion of his contributions provided he has not become a widower during his membership and that his wife (if any) is in a normal state of health.

Bachelors and Widowers.—A bachelor (or a widower with no children eligible for benefits) pays no disparity fee before marriage (or re-marriage). If the lady he marries is younger than himself he is required, on his marriage, to pay a sum equal to one half of the prescribed disparity fee for each previous year of membership.

Organization of the Society.—The Society is managed by a Committee of its members elected yearly. Consequently, there are no directors' fees, dividends to shareholders, expensive offices, paid collectors or canvassers—items which absorb a large proportion of the funds of an ordinary insurance company—and every possible penny goes to the Benefit Fund, also being registered under the Friendly Societies Act it is exempt from income tax, renders an account of its funds to the Chief Registrar each year and undergoes periodical valuations in accordance with the Act.

Early Membership is Desirable.—In order to ensure the maximum annuity for his widow it is desirable that an officer should join the Society early in life. It is not necessary to wait until marriage takes place. Memberships are open to bachelors, and a good start may be made during bachelorhood. If the lady married is younger than the member a portion of the disparity fee is saved. Many letters are received from officers containing the statement, "I wish I had joined earlier." If less than four memberships are taken up on joining, more, up to the maximum of four, may be taken up later.

The Officer of Substantial Means.—Officers in more affluent circumstances (or whose dependants are amply provided for) who desire to further the object of the Society may do so by means of annual donations or legacies. With more funds available the Society would be able to increase the scale of annuities.

Annuitants.—There are at present 235 widows receiving annuities, and letters frequently received reveal how much these annuities mean to them even in these days when money has such a low purchasing power. A letter recently received reads: "Thank you very much for cheque for which I am most grateful. Had it not been for this help I could not have stayed in my own home as rates and living are both increased."

Application for Membership and Further Particulars.—An application for membership form, together with further particulars, or a copy of the complete rules, with a statement of accounts, may be obtained from the Secretary on application.

Secretary's address:

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Flight—The Unbodied Joy—An Anthology of Flight

By SQUADRON LEADER W. T. CUNNINGHAM

You, sir, whose curiosity is so extensive, will easily conceive with what pleasure a philosopher, furnished with wings, and hovering in the sky, would see the earth and all its inhabitants, rolling beneath him . . . . How must it amuse the pendant spectator to see the moving scene of land and ocean, cities and deserts! To survey with equal security the marts of trade, and the fields of battle; mountains infested by barbarians, and fruitful regions gladdened by plenty and lulled by peace!

DR. SAMUEL JOHNSON: *Rasselas.*

THE SILENT WONDER

Shall I this night, amazed and full of wonder,
  Forget the Heavens and worship this new toy;
Shall I betray the stars and fall before
  A strange new Image, with a greater joy?
Caught in the searchlight's fingers, gleaming bright,
  A silver wonder, with a strange device,
Has made the stars, the great eternal stars,
  Peep out of their dark holes like timid mice!

W. H. DAVIES.

WINGED VICTORY

The eagle's brother, fledged upon his nest
  Of level earth, took off on windy dunes
To brave the absolute at last, to test
  His metal pinions on the whirling moons
Of space and build on ampler boughs of air.
  Above wing-ridden winds his instinct runs
To find the freedom of the last frontier,
  And send his song beyond the farthest suns.

The air is furrowed with his regal flight;
  He leaps the welted wind with bold intent,
And tilting silver wings against the light,
  Goes singing up the sky in brave ascent.

Forever starward bound his daring spirit
  Will soar above traditions of the flesh,
Reshape his nature unto systems near it,
  As he has done before, emerge afresh
On fields where pylons torched with planets blaze,
  Refuel from the sun, ascending higher,
Until he flashes up the starry ways
  On wings that feathered from his strong desire.

IRENE WILDE.

BREACHING THE MOHNE

The gunners had seen us coming. They could see us coming with our spot lights on from over two miles away. Now they opened up and their tracers began swirling towards us; some were even bouncing off the smooth surface of the lake. This was a horrible moment: we were being dragged along at four miles a minute, almost against our will, towards the things we were going to destroy. I think at the moment the boys did not want to go. I know I did not want to go. I thought to myself, "In another minute we shall all be dead—so what?" I thought again, "This is terrible—this feeling of fear—if it is fear." By now we were a few hundred yards away and I said quickly to Pulford, under my breath, "Better leave the throttles open now, and stand by to pull me out of the seat if I get hit." As I glanced at him I thought he looked a little glum on hearing this.

The Lancaster was really moving and I began looking through the special sight on my windscreen. Spam had his eyes glued to the bomb sight in front, his hand on his button; a special mechanism on board had already begun to work so that the mine would drop (we hoped) in the right spot. Terry was still checking the height. Joe and Trev. began to raise their guns. The flak could see us quite clearly now. It was not exactly inferno. I have been through far worse flak than that; but we were very low. There was something sinister and slightly unnerving about the whole operation. My aircraft was so small and the dam so large; it was thick and solid and now it was angry. My aircraft was very small. We skimmed along the surface of the lake and as we went my gunner was firing into the defences and the defences were firing back with vigour, their shells whistling past us . . . .

Then it was all over and at last we were out of range and there came over us all, I think, an immense feeling of relief and confidence . . .

Nearly all the flak had now stopped and the other boys came down from the hills to have a closer look to see what had been done. There was no doubt about it at all—the Mohne Dam had been breached and the gunners on top of the dam, except for one man had all run for their lives towards the safety of the solid ground; this remaining gunner was a brave man, but one of the boys quickly extinguished his flak with a burst of well-aimed tracer.

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Now it was all quiet, except for the roar of the water which steamed and hissed its way from its one hundred and fifty-foot head. Then we began to shout and scream and act like madmen over the R/T, for this was a tremendous sight, a sight which probably no man will ever see again.

GUY GIBSON: *Enemy Coast Ahead.*

SATAN IN "CU. NIMB."

At last his sail-broad vans
He spread for flight, and, in the surging smoke
Uplifted, spurns the ground; thence many a league,
As in a cloudy chair, ascending rides
Audacious; but, that seat soon failing, meets
A vast vacuity. All unawares,
Fluttering his pennons vain, plumb-down he drops
Ten thousand fathoms deep, and to this hour
Down had been falling, had not, by ill chance,
The strong rebuff of some tumultuous cloud,
Instinct with fire and nitre, hurried him
As many miles aloft.

and emerges from cloud into the dawn:

But now at last the sacred influence
Of light appears, and from the walls of Heaven
Shoots far into the bosom of dim Night
A glimmering dawn. Here Nature first begins
Her farthest verge, and Chaos to retire,
As from her outmost works, a broken foe,
With tumult less and with less hostile din;
That Satan with less toil, and now with ease,
Wafts on the calmer wave by dubious light,
And, like a weather-beaten vessel, holds
Gladly the port, though shrouds and tackle torn;
Or in the emptier waste, resembling air,
Weighs his spread wings, at leisure to behold
Far off the empyreal Heaven.

MILTON: *Paradise Lost*, Book II.

RETURN TO LIFE

I'd been up for perhaps ten minutes when I suddenly felt that I couldn't land. I thought of the words of an Air Force doctor in the days when I was training in the Service. He was white-haired and quiet, having been much with death, and he told us that every pilot is liable to reach a breaking-point, a time when his flying days are done. We laughed, I remember, being confident with the untried, arrogant confidence of youth.

It seemed that for me, this time had come. That I was finished, destined to crawl about the earth for the remainder of my life.

No more the feel of the engine roaring into life under one's hand, the joy of aerobatics when the horizon dipped and rolled and stick and rudder moved easily, firmly, quickly about the cockpit. No more the rugged comradeship of flying men, but my part to live in the past, glorifying incidents I ought to be surpassing, repeating anecdotes that would become woven into the fabric of my life so that it wasted away till my living was merely a frame for my memories....

I approached the aerodrome. A little group stood on the tarmac. Some of them were men and women I'd taught to fly.

I began to fray my body with my mind. "Land," I said. "Land, blast you!" The first attempt was a failure. I bounced high, put my engine on, fearing for the undercarriage, and went round the aerodrome again. I flew at two hundred feet, so as to leave less time to think as I came in. I turned very gingerly the last time and throttled back to glide. I could feel the sweat cold around my eyes, warm inside my gloves, gathering my shirt about my body. Now! I thought, and brought the stick back... back... back... watching the ground ahead as I'd never watched it since my first solo. When I thought the wheels were two feet above the ground I pulled the tail down, and with body tense and forearm rigid waited for her to stall. I felt the almost imperceptible shudder as she lost flying speed, and then she went down smoothly, softly, a perfect landing with the tail-skid rumbling on the sheep-cropped grass.

I twisted my head sharply to see if there was anyone coming in to land, and then took off again. I felt fine; bugles sang in my mind. I could land, flying was my job again.

JOHN LLEWELYN RHYS: From "Return to Life" in *England is My Village.*

THE GRIM PRIZE

I too have drunk delight in weakling's tears
The rapture of quick cruelty, and the prize
Of sudden prey. I too have handled fears
And filled the air with leaden merchandise,
Like a pitiless falcon nailed upon the skies.

FREDERICK V. BANFORD: *The Hawk.*

Grateful acknowledgments are made to: Messrs. Jonathan Cape for "The Silent Wonder" from *Collected Poems* of W. H. Davies, the author and *The Poetry World* (New York) for "Winged Victory," Messrs. Michael Joseph for the passage from *Enemy Coast Ahead*, by Guy Gibson, Messrs. Faber and Faber for the passage from *England is My Village*, by John Llewelyn Rhys, and the author for the lines from "The *Hawk*" (from *Icarus, Anthology of Flight*).

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A Guide to House Purchase

PLAN 1 **Buying a House in the Future**

If you effect a "guaranteed value" policy with me, then, at the end of **5** years, you will be able to purchase a House, or Small Holding costing and valued at a price equal to the face value of the policy—**WITHOUT HAVING TO PAY A DEPOSIT**—it will be **YOURS** with the **DEEDS** in **YOUR NAME** and a permanent security to your dependants. From that date you will only have **15** years to go to fully repay the mortgage advance, paying interest on the advance for that period instead of **20** years.

Your Life is fully covered, **INCLUDING WAR RISKS,** if death occurs during the first **5** years, the face value of the policy is paid to your estate, if afterwards, it automatically cancels the mortgage so that dependants are not left with a mortgage debt.

No better plan for saving with a definite object in view can be devised

PLAN 2 **Buying a House Immediately**

By effecting a "guaranteed value" policy for the amount of a mortgage advance, it acts as the means of repaying the advance, only interest is paid to the Society. In the event of death during the period, the mortgage is automatically cancelled. Income tax relief is secured on both premiums and interest payments, so making this plan most economical. Immediate advances are usually 80% of the valuation.

PLAN 3 **Special 90% immediate advance**

In special cases, where arrangements have been made with me prior to negotiating for a purchase, an immediate advance of 90% will be arranged, subject to income being in keeping with proposed commitment. Alternatively, make arrangements for a 100% advance at the end of 3 years.

NOTE:—All policies include the risks of war, aviation as a fare paying passenger, (Service pilots and crews can be included) which includes Service personnel being transported by Transport Command, and are world-wide in effect.

Every policy, not lodged as a mortgage security at time of maturity, provides for the option of a monthly income for life, guaranteed in any event to your estate for 10 years certain, in lieu of the cash maturity value.

100% at end of 3 years subject to 10% deposit pending date of completion.

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1. *Plan number which interests you.*
2. *Plan 1. State estimated future purchase price, failing this, indicate the amount you can afford to save per annum.*
3. *Plans 2 & 3. Indicate purchase in mind.*
4. *Plan 3. In confidence, state income and domestic responsibilities. Also indicate if interested in immediate 90% or 100% at the end of 3 years.*
5. *Rank.*
6. *Exact date of birth.*
7. *Whether payments will be Monthly, Quarterly, Half-Yearly or Yearly.*
8. *State if you can be contacted by telephone, giving exchange and number.*

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"Jenkins, my hat and coat!"

A short sketch given at the R.A.F. Staff College on the evening of 28th March, 1923, at the conclusion of the first course.

[The R.A.F. Staff College will be celebrating its Jubilee in April.]

Characters (in order of their appearance).

A student: S./Leader B. E. Smythies, D.F.C. (later, late W./Commander B. E. Smythies, D.F.C.).

Introducer: W./Commander R. E. C. Peirse, D.S.O., A.F.C. (later, Air Marshal Sir Richard Peirse, K.C.B., D.S.O., A.F.C., retired).

Nelson: S./Leader C. W. H. Pulford, O.B.E., A.F.C. (later, late Air Vice-Marshal C. W. H. Pulford, C.B., O.B.E., A.F.C.).

Cromwell: S./Leader C. F. A. Portal, D.S.O., M.C. (later, Marshal of the Royal Air Force, The Viscount Portal of Hungerford, K.G., G.C.B., O.M., D.S.O., M.C.).

Garibaldi: F./Lieut. N. W. Wadham (later, late S./Leader N. W. Wadham).

Mercury (a Messenger): S./Leader H. S. Powell (later, late W./Commander H. S. Powell, M.C.).

Jenkins (a waiter): S./Leader E. B. Beauman (later, late W./Commander E. B. Beauman, retired).

Scene.—The Immortals' Mess Ante-Room.

Time.—The Present.

CROMWELL: Good morning, Horatio. Good morning, Garibaldi. What about a small game of whisky-poker ?

GARIBALDI: As long as it's a short one. I have a conference on at 12 o'clock about the best formation for angels to fly in.

NELSON: Who's the chairman ?

GARIBALDI: Daedalus.

CROMWELL: But he knows nothing about it.

GARIBALDI: No, that's why he's chairman.

NELSON: I'll play too until 12 o'clock, but after that I've an important appointment at the George Hotel, Portsmouth.

(They start playing.)

NELSON: Where's Napoleon tonight ?

GARIBALDI: Oh! he's in bed with a bad attack of psycho-neurosis.

CROMWELL: Poor devil! Very painful it is too—I'm a martyr to it myself. Funny how fashionable it's become since they've invented the disease.

GARIBALDI: By the way, have you heard the latest joke from down below? Those poor students at the R.A.F. Staff College have had to write an essay on our morale.

CROMWELL: Is that the hot-air show at Andover?

GARIBALDI: No, there's precious little hot-air about it. They only have fires in the coal-hole.

NELSON: I don't know that I altogether like the idea of their writing about our morals.

GARIBALDI: No, you wouldn't Horatio. But it's about our morale not our morals—quite a different thing. That's the beauty of it—you can have very high morale without having very high morals.

CROMWELL: And you should hear their efforts. They are almost good enough to be published in the Unit Magazine.

(Enter Mercury riding his iron steed furiously.)

CROMWELL: Hallo! There's Napoleon's A.D.C. riding another horse to death.

MERCURY: (Having dismounted, approaches Nelson, salutes and says), Excuse me, Sir, Lady Hamilton's compliments and she's waiting for you at the George.

NELSON (aside): These Delilahs again! (*To Mercury*) Thank you, Mercury. Tell your mistress—I mean my mistress—that I am unavoidably detained at a heavenly Court Martial on that rascal Buggins.

(Mercury salutes and starts mounting his bicycle.)

NELSON: (calling him back) But don't go into any sordid details.

MERCURY: Aye, Aye, Sir, (*exit riding furiously*).

CROMWELL: Talking about Andover I listened to a very interesting lecture there the other day on the Principles of War. Funny how well we used to get on without them. (*Rings the bell.*)

GARIBALDI: Talking about books there's a new one just out that's all the rage down there. It's been banned by most of the libraries and bears the romantic title of C.D.22. It's pretty snappy believe me. But unfortunately the Staff College have been revising it. They've taken out all the doubtful bits and now it's hardly worth reading.

NELSON: That reminds me of rather a good story. It was the last day of the course at Andover, and a Student was seen to go up to the Commandant and inquire the way to the Library.

(Enter Jenkins with papers and a tray.)

JENKINS: Did you ring, Sir ?

CROMWELL: Yes, Jenkins, please bring three Ambrosias. Is there any news in the papers? Come, Jenkins "do not let your thoughts be moulded by the words at your disposal." Use your mobile brain.

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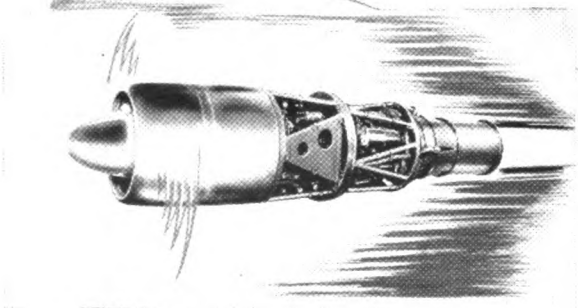

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JENKINS: Well, Sir, I 'ad it, from one of them decayed tapsters and serving men in the D.S. room that there is a strong rumour of peace between Northland and Southland. They do also say as 'ow Charon is kicking up a row at the Estimates. He wants a hawk to be attached to him to do reconnaissance across the Styx. He says his eyes are getting that weak.

(Exit Jenkins.)

GARIBALDI: Same old gag. Why, the gods let Charon have a hawk to assist him once, but they had to take it away again because he starved it and treated it so badly. But now that hawking is becoming popular he doesn't want to be left out of the picture.

NELSON: That's all very well, but I'm strongly in favour of liaison.

CROMWELL: We know all about that Horatio. Rather an unfortunate word for you to use except in the purely military sense. It always reminds me of a French governess and . . .

NELSON (*breaking in*): That's quite enough, Oliver. By the way, I had an interesting experience the other day, which I must tell you about. I went and had a look at one of the mortals latest inventions—their trains at St. Pancras.

CROMWELL: Did you say trains or rains ?

NELSON: Trains. There's nothing now I don't know about shunting goods trains. It really was most exhilarating. But I had rather a narrow escape there. The London-Edinburgh express nearly hit me in the back.

GARIBALDI: Funny how history repeats itself. You remember that famous order of the day of mine to my followers:

"I offer neither pay, nor quarters, nor provisions. I offer hunger, thirst, forced marches, battles, red ink and death."

Well, they are now sending a copy of that round to the Students before they join the R.A.F. Staff College. By Jove, it's nearly 12, I must be off. (Shouting) Jenkins, my hat and coat!

Curtain.

E.B.B.
("JENKINS").

Staff College,
Andover.
25th March, 1923.

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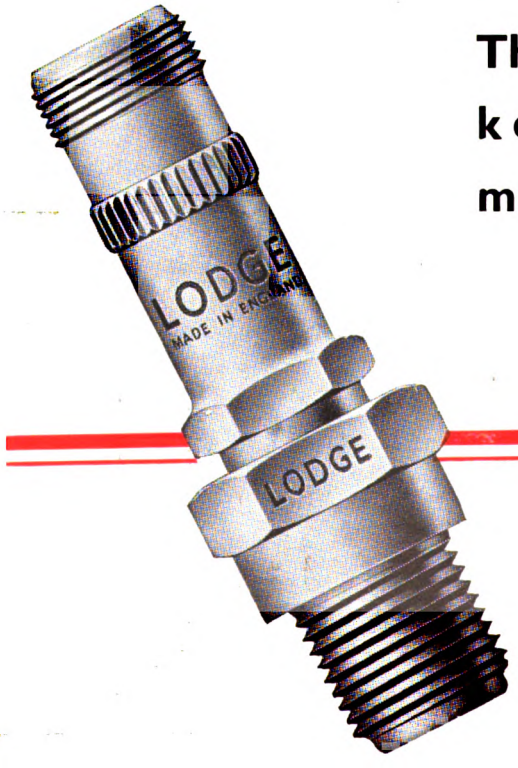

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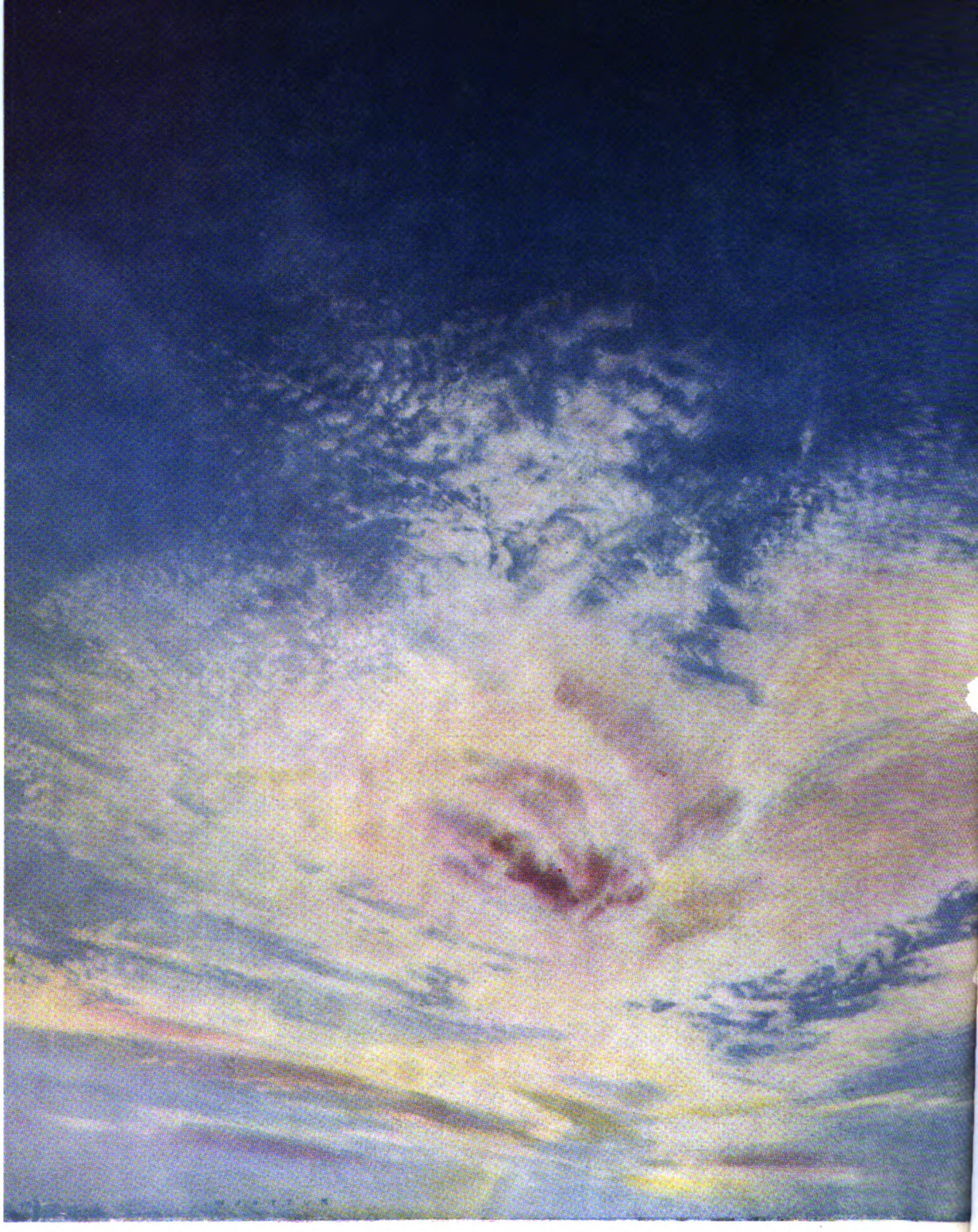

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EDITORIAL

WHAT IS RUSSIA DOING ?

A VALUABLE contribution towards the answer to this question is made in a recent report by the International Committee for the Study of European Questions, among whose members are such well-known authorities on foreign affairs as Lord Vansittart, Lord Elibank and Lord Brabazon of Tara. Notices of this report appeared in various Sunday and daily newspapers early in November, 1947.

Russia, suggests the report, is pursuing a well-thought-out policy for establishing her influence over the new Germany that will be created by the Peace Treaty. To this end, it is alleged, Russia is reviving the Wehrmacht, having already formed several divisions out of German prisoners-of-war of whom, the report says, there must be about 2,500,000 in Russia at the present time. This force is officered by German officers who have been trained in Soviet military schools, and Field-Marshal von Paulus is named as its Commander-in-Chief.

This Russian-trained German army could be an invaluable agent for spreading Soviet influence throughout the whole of post-war Germany so soon as the British, French and American armies of occupation are withdrawn. It could also be relied upon to protect the Russian lines of communication through Eastern and Central Europe if a Russian army were operating in Western Europe. The report also alleges that Russian and German scientists are collaborating in military and technical research and in the manufacture of arms.

Peaceful penetration on political lines is also alleged. Many key positions in the Eastern zone of Germany are now said to be held by officials of the Free German Committee. Some of these were once ardent Nazis who have been "pardoned" on their espousing Communism, and all have been trained in Communist ideas and methods. In this and other ways, it is suggested, the U.S.S.R. has made the Russian zone of Germany entirely dependent upon Russia both politically and economically. All the great estates in Eastern Germany have been broken up and the land distributed to the peasants, while most of the factories and laboratories have been dismantled and transported to Russia as reparations.

While Russia's direct political and economic influence in Germany is necessarily confined to her own zone of occupation, it is suggested that she contemplates applying the same tactics to Western Germany as soon as opportunity occurs, with the object, apparently, of using the future Germany as an advanced bastion of the U.S.S.R. for defensive and offensive purposes against the Western Powers. In order to achieve this, it is obviously in her interests to oppose partition and to support the establishment of a united Germany; not only because there would be a much larger territory subject to her influence, but also because she would thereby gain the support of German nationalists.

That this policy constitutes a menace to the Western democracies cannot be doubted. It is a further extension of the Russian policy of consolidation, justifiable as defensive in Eastern Europe (and so justified in a previous number of this journal), but now pursued to, and beyond, the point where defensive becomes offensive strategy.

It is difficult for the Western nations to devise a policy which can adequately counteract this Russian penetration. The Russians have the advantages of singleness of purpose, ruthlessness and the appeal to the strong desire for unity among the Germans. By way of counter-measures, the recommendations of the international committee whose report is the subject of this article are: (*i*) that development and control of industry in the Rhineland and the Ruhr should be entrusted to an organization representing the United Kingdom, France, the United States, Belgium, Holland and Luxembourg; (*ii*) that the balance of steel production should be shifted to territory outside, by co-operation between German coalfields and neighbouring ore-producing areas in other countries; and (*iii*) that the three powers at present in occupation of Western Germany should continue to maintain armed forces in that zone.

These proposals, though possibly the only practicable measures, are open to serious

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objections: (*i*) whoever may develop and control industries in the Rhineland and the Ruhr, those industries remain where they are, *i.e.*, in Western Germany; and if Russia gains control over Western Germany, whether directly or indirectly, those industries would be at her mercy and she could take them over at her pleasure, regardless of "control" whether near or remote; (*ii*) a marriage of German coalfields with French or Belgian ore mines would be truly a "marriage of convenience" in which German coal would be the predominant partner, and it would continue only so long as the *de facto* rulers of Germany were pleased to allow it; and (*iii*) the continued military occupation of Western Germany by British, French and American troops would admittedly be a safeguard against further Russian infiltration, but it would be very difficult to reconcile the population of Western Germany to it, particularly in view of Russia's proposal (if made) to unify Germany again and to withdraw all armies of occupation.

The alternatives, therefore, seem to be *either* a united and nominally free Germany, with a central government in Berlin more or less under Russian influence and without armies of occupation, *or* a Germany divided into two parts, the Eastern part a satellite of the U.S.S.R., and the Western part enjoying an uneasy autonomy guaranteed and protected by the Western democracies. Across the frontier between these two parts of Germany, the Soviet Union and the Western democracies would glare at one another with suspicion. How long it would be before this highly explosive situation would develop into open war must depend partly on circumstances and partly on the will of the side least concerned in the maintenance of peace.

DEFENCE PRIORITIES

The policy of His Majesty's Government in the matter of defence was indicated by Mr. A. V. Alexander (Minister of Defence) in the House of Commons on 27th October, 1947, while replying to an amendment to the Address in response to the Speech from the Throne. He said:

"In the light of circumstances with which we are faced, my own view is that the first priority, which must not be interfered with, is defence research. The second, in the light of the present developing situation, must be to maintain the structure of the Royal Air Force, and its initial striking power. The third priority is for the maintenance of our sea communications, and, therefore, for the most efficient Navy we can get in the circumstances, and then we will do the best we can for the Army."

From the Royal Air Force point of view, this must be regarded as satisfactory. No one will question the first importance of defence research; and it is reasonable to give the Royal Air Force next priority, since it is now admitted to be Britain's first line of defence and the first Service to go into action on a large scale on the outbreak of war. The third priority accorded to the Navy recognizes its indispensability as a guardian of our sea communications and a protector of our shores against invasion; but these responsibilities it now shares with the Royal Air Force, co-operation between the two Services having now reached a high pitch of efficiency.

We may, however, regret the casualness of the reference to the Army; but we must assume that the Minister of Defence did not intend the natural implication of his words, which were probably jocular. Everyone recognizes that the Army is still, and will remain, an indispensable part of our fighting forces; and that it is relegated to a position of fourth priority only because the other two Services must come into action before it and because it is assumed that a soldier can be trained in less time than a sailor or an airman.

Generally speaking, however, it is open to question whether this policy of giving priorities is a wise one. Defence is surely one and indivisible. Neither of the three Services could undertake the defence of the United Kingdom, still less that of the Commonwealth and Empire, without the help of the other two. The interdependence of the three Services was well illustrated by Admiral-of-the-Fleet Lord Cunningham of Hyndhope at a meeting of the Royal United Service Institution, on 22nd October, 1947, in the following words: "In the years between the wars, the Services had been unable to advance a common doctrine on the way in which a war in the Mediterranean was to be fought. At the start of the war we had complete control of that land-locked

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sea. We lost it because we lost the land bases necessary to provide the air cover essential to maintain our supplies. All our history has depended on our sea communications and we must now control the sea and the air. To control the air we must capture the necessary bases which must be held by the Army. And to protect and supply the bases we must control the seas; thus coming full circle."

There is, therefore, good reason for Lord Newall's plea, which he made in the House of Lords on 28th October, 1947, for a consideration of our defence policy as one whole now that we have a Ministry of Defence. Speaking of the proposed reductions in the Armed Forces, he said: " . . . I do not propose to deal with the merits or otherwise of the recent cuts. We all know full well that some reductions are inevitable. There is, however, apprehension that these cuts may be made without due regard to the inter-dependence of the three Services, and may result in our Defence Forces, as a whole, being unbalanced and inadequate for the preservation of our security. . . . It is really unsound to consider the requirements of any one Service by itself without having regard to our defence requirements as a whole. . .

"We now have an opportunity of considering our national defence policy and the requirements of the three Services as one whole. I trust sincerely that the Minister of Defence will seize hold of the job with both hands, and hold it firmly; though I regret to say that even now I see symptoms of that same unfortunate state of affairs as existed before the war. . . . Surely, after all our experience of the past war and the necessity of having co-ordinated Forces, not only sailors, soldiers and airmen, but all thinking citizens will realize that it is only by a properly balanced and fully efficient Defence Force, based on close co-operation between the Services, that we can hope to preserve our security and maintain our needs for peace and law and order throughout the world."

DEFENCE OF THE WESTERN HEMISPHERE

It is probable that in the next war, assuming that there will be a next war, the American continent will be in danger of attack. For this very good reason, most of the States, large and small, whose territories cover the Western Hemisphere, have already come to an agreement on matters concerning their joint defence.

The Pan-American Union, formed some time ago, provided in general terms a united political front against economic or military aggression from the Old World, but detailed plans for common defence were not made. The recent Act of Chapultepec, signed at Mexico City in 1945, provided for concerted action by the United States and the Latin-American countries in case of aggression in their hemisphere; and soon afterwards the Charter of the United Nations recognized the existence and value of such "regional agreements" for mutual defence. Now, in 1947 (on 2nd September), a further treaty has been signed at Rio de Janeiro by nineteen of the twenty-two interested States. The main point of the treaty is the declaration that "an armed attack by an outside Power against any American State is to be considered an attack against all." Decisions for collective action agreed by two-thirds of all signatories will be binding on all—except that "no State shall be required to use armed force without its consent." Canada is not a signatory to this treaty, but her defence is already linked to that of the United States by the existence of the Joint Staff Board. The other two absentees, Nicaragua and Ecuador, were absent only because of internal political changes and may be expected to sign very soon.

For obvious reasons, the United States will be the arsenal of this defensive alliance; and Congress, at the request of President Truman, has already agreed to the terms upon which arms and equipment shall be supplied to the Latin-American States, one significant proviso being that they shall not be passed on by the receiver to any other State. Military organization, training and equipment will be standardized according to the recommendations of the Inter-American Defence Board; and a Joint Staff of American military chiefs will be chosen at a meeting of the delegates of all the signatory States in January, 1948.

Thus the Western Hemisphere prepares to withstand external aggression from whatever quarter it may come; and thus the Monroe Doctrine, first propounded in 1823 and never since renounced, is applied again in a fresh manifesto declaring the inviolability and solidarity of the American Continent.

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MODERN WARFARE

IT is customary and necessary, after every great war, to consider how the experiences of that war have modified the principles of warfare. Perhaps it is too early to enunciate the lessons of the Second World War; but the commanders of our sea, land and air forces are even now busy collecting and recording the data upon which those lessons will be based, and from time to time, in speech and in writing, they indicate some of the trends of professional thought in these matters.

As was to be expected, the fundamental principles of war remain unchanged, and in particular that which says that warfare is essentially a method by which the will of one nation is imposed on another nation. That has been the object of war—or perhaps we should say of civilized war—ever since inter-tribal raids developed into a specialized form of foreign policy. There are other ways in which one nation can impose its will upon another nation, *e.g.*, by diplomacy. And as it has been said that war is only diplomacy carried out in another sphere, *i.e.*, on wide battlefields, so diplomacy may be said to be war carried on, without bloodshed, in chancelleries and embassies. But that is by the way. Equally unchanging are the three stages of warfare, all of which must be completed, though the order of their completion may be varied. These three stages are: the destruction of the enemy's armed forces, the occupation of his territory and the submission of his government.

Among those who have recently pronounced upon the principles of war, as they have been affected by recent experience, is Field-Marshal Lord Montgomery; and *The Times* Military Correspondent has been at pains to collect the dicta of the C.I.G.S. and to summarize them in ten points. They are reproduced below, with comments.

"1. *The master principle is sound selection of the aim to be sought and steady maintenance of that aim.*"

This needs no elaboration, and its application to air operations is obvious. But circumstances may arise in which a change of aim is necessary, and then a too rigid adherence to plan may be disastrous, as is indicated in Point 8, below.

"2. *Success in war depends more on moral than on physical qualities.*"

Various estimates have been made, by the great captains and by historians of war, of the relative importance of the moral and physical qualities; and any expression of their relationship in terms of mathematical units must be arbitrary and deceptive. The C.I.G.S. wisely contents himself with giving precedence to the moral qualities; and none has paid more attention to the morale of his troops. Morale is not only "the will to win," it is also confidence in one's leaders and in oneself, and a conviction of the justice of one's cause.

"3. *Offence is the necessary forerunner of victory; while it may be desirable to postpone it, without it victory is impossible.*"

It must be obvious that no war can be won by sitting down and waiting for the enemy to attack you, even though you may be able to beat off his attack. Successful defence is not victory but a denial of victory to the enemy. Victory can be achieved only by a successful offensive; though a stubborn and successful defence may, and often does, precede the offensive and contributes to it by weakening the enemy.

"4. *Security is essential to freedom of action; this does not imply undue caution, but on the contrary encourages boldness and vigour.*"

The word "security" here needs careful interpretation. It does not mean freedom from loss or attack; for a force operating "with boldness and vigour" is inviting attack and some loss, both of which are inseparable from the bringing of the enemy to battle. Security here means security against surprise and against attack from an undesirable direction, and this is implied in the phrase "freedom of action." It also means ensuring the maintenance of the initiative, so that the commander can manœuvre not only his own armies but also those of the enemy and "get them where he wants them."

"5. *Surprise brings results out of all proportion to the effort expended.*"

If the advantage of surprise is obvious, the means whereby surprise is achieved may not be. The long and careful planning that is necessary before even a small operation, and the number of people who must be informed beforehand of certain essential details, render the most careful security measures necessary over a period which may be long or short according to the magnitude of the operation contemplated; and during any part of this period leakage may take place which may compromise the whole operation by giving the enemy just the hint he needs. Surprise can be achieved, however, not only by denying information to the enemy (the negative method) but also by the positive method of giving the enemy false information, as was done so successfully by Lord Allenby before his final advance in Palestine in 1918.

To surprise the enemy is to exploit both his relative weakness at the point of attack and the time which must elapse before he can bring his whole force to oppose the attacker. Thus a sur-

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prise operation may be carried out successfully with far fewer ships, troops or aircraft than would be necessary in an operation which the enemy expected, and the tactical advantages gained are out of all proportion to the cost in men and material. But it should be borne in mind that, once the operation is begun, the element of surprise disappears and the objective must be gained before the enemy has had time to complete his counter-measures.

"6. *Concentration of force at the decisive time and place is a prerequisite of success; it may not involve massing of forces but rather so disposing them that they can unite for the blow where and when required (cf. Napoleon's 'Strategic Square').*"

"On concentration," writes *The Times* Military Correspondent, "new weapons render all concentrations vulnerable, yet they remain tactically necessary; concentration should, therefore, be as swift and as secret as possible." And this explains the need for judicious strategical and tactical disposition of forces. Air forces, much more than sea and land forces, are able to concentrate rapidly and effectively at any point from widely separated bases; and for that reason are less vulnerable and better able to achieve a surprise attack.

"7. *Economy of effort implies a balanced employment of forces.*"

Modern warfare is so much a science that it is possible to compute with a high degree of accuracy the size of the force required for the successful performance of any given operation and the proportions of its various components. Economy of effort, therefore, implies a balance of forces and not a cheese-paring reduction to a minimum. Many offensive battles have been lost because the commanders embarked upon them with too small forces; and one more ship, one more division or one more squadron of aircraft might sometimes have turned the scale. The wise commander (and Lord Montgomery as much as any) insists on a certain superiority, numerical, mechanical or tactical (and perhaps all of these) before he embarks upon an offensive operation; and he satisfies himself beforehand that his objective is not only attainable but is well within the capacity of his force to attain. Upon that characteristic of their commander was mainly based the confidence of the Eighth Army. Putting this principle into practice may sometimes involve bullying the Government for more troops, more weapons and more supplies.

"8. *Flexibility is needed in modern war to enable plans to be adapted to changing situations.*"

So great is the speed with which operations of war are conducted nowadays that flexibility is of the first importance. The situation may change at any time and change completely; and a commander must be able to divert his force from a planned objective to exploit an unexpected circumstance, and even to change the functions of the components of his force and their relative proportions. This calls for considerable education and intelligence in the personnel and careful training in adaptability.

"9. *Co-operation, based on the team spirit, entails the co-ordination of all forces to achieve the maximum combined effort.*"

The importance of co-operation, again, needs no emphasis. Effective co-operation, like adaptability, depends upon education and intelligence; it also requires that each part of a force shall know and understand the commander's intentions and what the other parts of the force are doing. Hence the need for taking the individual sailor, soldier or airman into the commander's confidence. Lord Montgomery insisted on having his plans explained to the rank and file before going into action; and this he did, not only to raise their morale, but also to make co-operation more effective. Nelson made every man in his fleet feel that victory depended upon his own individual efforts; but it is doubtful if his gallant, but uneducated, sailors and marines could have understood his tactics if they had been told them. Modern navies, armies and air forces consist of well educated and highly intelligent men, and they must be treated appropriately.

"10. *Administration must be designed to give the commander the maximum freedom of action, and every commander must have a degree of control over the administrative plan corresponding to the scope of his responsibility for operations.*"

This is self-evident. The administrative and supply services must always be the handmaidens of the fighting formations, and the commander must control all three. Particularly important is it that subordinate commanders shall have sufficient control over their ancillary services. The wise commander will, however, be careful to consult his administrative and supply staffs when planning operations, and to ensure that he does not attempt any operation which is beyond the capacity of his ancillary services to support.

To these ten points must be added one other, which the experience of the Second World War has shown to be as important as any. Lord Montgomery has repeatedly said that no major operation of war can be successfully performed until the air battle has first been won. And this applies as much to naval as to land operations. All major operations of war are, therefore, com-

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bined operations. The gaining and maintaining of air superiority is the first duty of the air arm, which thus becomes the first line of offence as well as the first line of defence. Its second duty is to assist the sea and land forces by providing direct air support. But this must depend upon the weather. Sea and land operations, as *The Times* Military Correspondent says, should normally be independent of air support which, if given, should be regarded as a "bonus," especially if time is an important factor. "When fire support from the air is essential, suitable weather must be awaited."

Not the least important of the lessons that have been learned from the recent war is the way in which combined operations should be carried out. There was marked weakness in this respect during the First World War. Ideally the three Services taking part should be as closely co-ordinated as the units of a fleet, of an army, or of an air force. This can be achieved only by the most careful and detailed planning and by ensuring that the detachment of each Service fully understands the function and methods of each of the other two. "Planning for combined operations," to quote the same authority again, "must be longer and more detailed than for any other form of military enterprise because control is so limited, indeed in some phases non-existent; it is impossible in a short-range combined operation to make alterations in dispositions at any stage of the voyage and equally impossible to accelerate the 'build-up.'" Hence "training for combined operations must now be a normal part of peace time training for all British forces."

We publish elsewhere in this number of THE R.A.F. QUARTERLY *Lord Tedder's views* on this subject which recently appeared serially in the *Sunday Express*.

A HEAVY BOMBER SQUADRON IN THE FIELD

BY WING COMMANDER J. C. MILLAR, D.S.O., R.A.F.

(Contributed to the series, "Lessons I have learned from the War")

MOBILITY is an accepted principle of war. In action, air forces are, by their very nature, mobile. On the other hand, the mobility of the ground organization supporting an air force can vary to a great extent. An air force supported by a ground organization which lacks mobility is like a boxer whose footwork is bad; he may be able to hit hard, but that avails him nothing because he cannot reach his opponent. This illustration applies particularly to the support given by heavy and medium bombers in mobile warfare, and there can be few better instances than their employment in North Africa and Italy during World War II. I was fortunate in having first-hand experience of the work of a heavy bomber squadron during the latter stages of the Italian campaign.

Operating a heavy bomber squadron in the field is like looking after an elephant at a garden party; you have little to worry about so long as the beast does nothing. This article is designed to summarize some lessons learnt in a heavy-bomber squadron during a period of intensive operations against the enemy.

At home the members of a heavy-bomber squadron were concerned solely with operations. Administration and maintenance were provided by a station organization, leaving the squadron free to concentrate on fighting. Overseas the situation was usually very different. A squadron might have to undertake for itself functions such as messing, transport, provision of accommodation and personnel matters. If these administrative functions are weak, operational efficiency is bound to suffer before long. Thus the main lesson to be learnt is that Squadron and Flight Commanders, and all other officers who have squadron duties, must not concentrate entirely on their operational duties to the detriment of administration. Good administration and welfare are essentials.

The choice of a camp site is worth some study. Firstly, the camp should be placed some way from the airfield. Admittedly this places a strain on transport, but the advantages are worth while; the domestic camp is comparatively free from mud or dust (whichever is the prevalent vexation); aircrew resting after night operations are not disturbed by the din of a day formation starting up and taking off; dispersal is improved by keeping those not on duty away from the airfield which is always a potential target; and you are more likely to find a good camp site if your choice is not restricted to the immediate vicinity of the airfield.

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The layout of the camp itself is important and involves reconciling two conflicting requirements—a well-dispersed camp which is proof against enemy action, and a compact camp which is easy to guard. The first requirement, and its close relation, camouflage, is well known, but the second is not always so readily understood. Frequent guard duties, together with fire piquets, are arduous for a unit with a small establishment of ground tradesmen who already work long hours on their technical duties. At the same time a very understandable bitterness is felt by aircrew who arrive back after a long night sortie to find that their tents have been rifled and their belongings stolen. The best preventatives, in countries where thieves abound, are a compact camp and ruthless determination on the part of sentries. I well remember telling my Squadron Warrant Officer to instruct sentries to shoot if the customary challenges were ignored, to which he replied, "But, Sir, they might hit someone." Well, a few days later a Corporal on guard was almost knifed by one of the local banditti—and after that sentries did shoot, and there was a noticeable decline in camp thieving.

Some degree of comfort, particularly in the European winter, can do much to cultivate welfare and personal contentment which form such an important background for operational efficiency. Salvaged material can be used for making huts to replace tents. Some aircrew lines were models of private enterprise; each building was in conception like the modern prefab, but each was an individual masterpiece of architecture and ingenuity. The actual building of these huts was valuable in keeping the minds of aircrew occupied during trying periods of stand-down from operations.

Heating of huts and tents in Europe is important. In Italy there were never sufficient stoves to go round. Consequently, men made their own, which was illegal, and which led to fires and risk of life. On camp inspections, Commanding Officers preferred to overlook this practice rather than condemn their men to live in extreme cold and damp. There were continual formal investigations into fires, and a fair loss of public and private property.

All who have served on home stations know the practical value, and sometimes nuisance value, of that hoarse and imperious voice known as the Tannoy. It has no counterpart in the field, and the lack of such a broadcast system can be keenly felt. Operations are perforce often cancelled at one minute—on again the next—then cancelled—ordered again—in a succession of orders and counter-orders which make the marshalling of transport, aircrew, and ground crew, at short notice, a difficult task on a tented camp. Some form of mobile Tannoy for use in the field would be of great value.

The primary concern of Wellington, when he fought his first campaign in India, was to obtain sufficient bullock carts, and according to Mr. Philip Guedella, his recent biographer, the Duke made transport his first consideration in all subsequent campaigns. The modern Commanding Officer of a squadron in the field can well follow his example. Without good transport a squadron in the field is like a man walking with bad blisters on his feet; he can get along, but he will not get very far. The modern applications of the principle of good transport are not difficult. Transport required only when the unit moves should not be laid up continually, but should be taken out on the road for periodic test runs, otherwise it will give trouble at a critical time. Only those tested and authorized should be allowed to drive Service vehicles. Periodic inspections of M.T. must be observed however great the temptation to ignore them, using operational urgency as an excuse. Paper work in connection with M.T. should be handled quickly in order to avoid delays in obtaining replacement vehicles and spare parts. Finally, if officers take a personal interest in the work of drivers and M.T. maintenance tradesmen, it will pay a handsome dividend.

A squadron based on a home station during World War II had much to be thankful for: week-end and other leave periods to visit families and friends, local towns in which to find amusement, and good facilities for sport. A squadron in the field had few of these comforts. Consequently, boredom was always ready to overcome even the keenest. The antedotes were entertainments and camp activities such as a cinema, E.N.S.A. shows, lectures for both training and recreation, E.V.T., inter-section quiz competitions, and organized games. Probably the most important aspect of all these is that officers must take the lead and organize. Otherwise there will be aimless enthusiasm and little accomplished. Then there is spiritual welfare. The Padre can do much more if he has a proper tent furnished as a church than if he has to take his chance of finding the N.A.A.F.I. or briefing tent free.

Rest camps do much to keep men fresh during an overseas tour. Often they are sited in some health and beauty spot remote from any town. Now our present-day forces are composed largely of town dwellers. After long periods in the field it is the crowds and activity of a town which they yearn for, and in the writer's opinion that is what they need to counter the effects of

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staleness and monotony. A few may get themselves into trouble, but the welfare of many is increased by rest camps in or near towns.

This article has attempted to show how certain aspects of comfort and efficiency can be attained under field conditions. Like all good things, the measures advocated have their attendant dangers. In this case they can be summed up in the expression, "getting too much dug in." A squadron must never lose sight of the fact that with the changes of war it may have to move almost anywhere at any time. Whatever is done must be subjected to the question—how quickly can it be undone? Vehicles stripped of components, mobile equipment removed from its vehicles and set up as static equipment, neglected tents, lavish baggage and furniture may all be a drag on mobility.

Most of us in the Royal Air Force are now settling down to an established routine under conditions of peace. There will undoubtedly be exercises in mobile operations, but no exercise can ever reproduce conditions in the field on active service. The lessons learnt in the field during World War II should not be neglected by potential squadron and other unit commanders.

The Problem of our Future Security

BY MARSHAL OF THE ROYAL AIR FORCE, LORD TEDDER

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The Last war is not modern: It is already out of date————

MODERN war means total war. It means that sooner or later the nation involved will devote its whole national effort to the single object of winning the war. At the outset of a war time is the supreme factor. As Mahan put it, "It behoves countries whose people, like all free peoples, object to paying for large military establishments, to see to it that they are at least strong enough to gain the time to turn the spirit and capacity of their subjects into the new activities which war calls for.

A crucial question is: How long will it take a peaceful nation to reorganize and switch over the whole of its national potential to the one supreme task of fighting and winning the war?

Do not let us forget that the aggressor is also concerned with the time factor; he is ready, otherwise he would not provoke armed conflict; he inevitably hopes and plans for a quick decision, since no one would wish for a long war if it could be avoided; moreover, he wants a decision before his opponent has had time to "turn his capacity into the new activities which war calls for." The peace-loving State, therefore, must not merely have the staying power to hold on until its war potential is fully mobilized; it must also have the initial strength to withstand the initial shock—intended as that is to be a knock-out in the first round. The initial strength must, moreover, be ready at all times.

One of the features of modern scientific and technical development is that more and more the scales are being weighted in favour of the "Blitzkrieg"; as modern weapons develop the potentiality of the initial blow tends to grow and grow.

We managed to win the last war—and win it decisively—but it took us nearly half as long again as the previous war despite our national unity. It is true that the cost in lives to the British Commonwealth and Empire was far lighter in World War II. than in World War I.—just over 1,000,000 casualties compared with over 3,000,000—but the money cost of this last war was £26,000 millions.

QUESTIONS

There are some awkward questions to be asked to which we must get the sure answers.

To what were the astronomical cost and long duration of the war due?

How far were they due to the way the political cards were stacked in 1939—*due, in other words, to faulty policy in the years between the wars?*

Was our immense war effort directed into the right channels?

Were our Forces properly balanced?

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Did we fight the war in the manner best suited to our special capabilities and limitations?

How far were the length and cost of the war due to the general unreadiness at the outset which has so often been typical of "free" people?

How far due to military and technical unreadiness for the type of war which actually eventuated?

The technique of warfare is always changing, sometimes drastically, yet I'm afraid one must admit that the military mind is only too often very unreceptive to new ideas and new methods. The chivalrous horror and disgust which the armoured knights of old felt for the vulgar invention of gunpowder was matched not so many years ago by similar righteous disgust at the breach of gentlemanly military etiquette by the introduction of the airplane and the bomb. Now we are faced with the frightening potentialities of the atomic weapon.

Our Position

We British are often accused of preparing for the last war, or even the last war but one. I am quite sure we cannot afford to do that in these days.

The last war is not modern, it is out of date.

Prior to 1914 the solution to the problem of our security was a relatively simple one. British strength lay in seaborne commerce and British security rested on her naval forces, her world-wide bases and her own insularity. In other words we relied entirely on sea power. In those days Britain could spend as much or as little as she chose on the land campaigns which at frequent intervals have torn Europe asunder.

In 1914 we changed all that and, instead of being able to rely on sea power alone, we were then compelled to raise and maintain a Continental army. No longer could we take as small a part as we liked in the war; war became a very expensive business in men, money, and material.

Air Power

Then, further to complicate our problems, war spread to the third dimension. The first daylight air raid on London in 1917 showed the writing on the wall, and a certain wise man called General Smuts reported to the War Cabines:—

"The day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and populous centres on a vast scale may become the principal operations of war, to which the older forms of military and naval operations may become secondary and subordinate. Air supremacy may in the long run become as important a factor in the defence of the Empire as sea supremacy."

World War I left us with a number of problems unresolved. By general consent sea power was still our first requirement; and yet, though our command at sea (in the old sense) had become complete, our battle fleet undefeated, the enemy fleet driven back to harbour ultimately to surrender ignominiously—despite all this, interruption of our seaborne supplies had brought us nearer a fatal crisis than ever in our previous history.

It is obvious that the submarine was a new and major factor, the airplane a potential factor affecting sea power.

Clearly some drastic changes were developing in the methods by which sea power could be exercised. Nevertheless, I'm afraid that one must admit that the arrangements for the exercise of sea power on the outbreak of World War II showed no real change in character from those in force twenty-two years earlier.

The Test

On land also there was the unsolved problem of reconciling our peace-time policy of a small professional Army for imperial policing with a probable wartime policy of operating a large Continental army in Europe. The year 1939 found us with an Army with equipment quite inadequate in quality and quantity and lacking any reserve organization for expansion to the scale of Continental warfare. In the air, thanks to a few farsighted and determined men, we had the basic organization which subsequently stood the test of war, we had, thanks to the breathing space given us in the opening

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months, an air defence just adequate to cover the evacuation from Dunkirk and subsequently to win the Battle of Britain. But the other component parts of our air power were at the outset quite inadequate to meet the immediate commitments.

Strategy

It was practically three years before the principal arm of air power, the Bomber Force became a power in the world; the air forces for the defence of our overseas bases, for tactical support of land operations, for contributing to sea power—all these were totally inadequate at the outset. Moreover, inadequate as were the air forces for support of the Army, the Army provision for support of the air—A.A. and ground defence of air bases, provision of engineers for airfields, etc.—was even more inadequate.

I feel we must frankly admit that after World War I we as a nation failed to see war as a single problem in which the strategy, the tactics and the technique of sea, land, and air warfare respectively are inevitably and closely interlocked.

It was argued that sea power was the exclusive preserve of the Royal Navy, that land operations were the preserve of the Army; by many the very existence of air power was denied; combined operations were literally a no-man's land. Easy criticism perhaps. But criticism is needed. We cannot afford to make mistakes. Sometimes I feel we have a tendency to concentrate too much on our successes and our enemies' failures and, consequently, to draw our lessons too much from the final stages of war.

In 1939

I suggest that there is danger in this. In the latter stages of the war, after some years of lavish expenditure of money, material, and man-power in the equipment and manning of all arms of the fighting Services, military problems have a way of becoming relatively easy of solution. Surely it is the more difficult problems of the early stages of the war which we should study. It is at the outset of war that time is the supreme factor.

Were we, in September 1939, *"at least strong enough to gain the time"?*

Is there not some justification in the accusation that Abyssinia, Austria, and finally Czechoslovakia were successively sacrificed because we were not strong enough?

I suspect that most thinking people in this country felt deep shame about Munich; I know I did; but I well remember the overwhelming relief which, from the military point of view, one felt. Munich gave us a year—and then the "phoney war" gave us another eight months.

Despite all this, the Battle of Britain in 1940 was a very close call. Could we have won it in 1939? I think not.

The providential eight months made the Battle of Britain possible and saved Britain, and much else besides.

Tide of War

In April, 1838, the estimates of the three Defence Departments for the ensuing year totalled £343,250,000, with an additional £8,500,000 for A.R.P. services; yet at the time of Munich this country was virtually defenceless. It took three and a half years of fighting before the tide of war really began to turn; three and a half years of fighting with forces which were unbalanced and inadequate; fighting in which we could not attempt to recover the initiative except in the air; fighting, not to win the war—that came later—but to avoid losing it. We started fighting in the last ditch, and it was four years before the land, sea, air Goliath we were building was ready even to begin to fight to win. It is in these early years that the mistakes, whether of policy of technique, stand out most clearly.

Next Time

It would be a singularly futile business for us, having been brought uncomfortably near bankruptcy by two wars on the blank cheque basis, to complete the journey to the bankruptcy court by uncritical defence expenditure in peace. Any future war would inevitably be total war and world-wide. But that does not necessarily imply that we should conduct our share of such a war on similar lines to those we followed in World Wars I and II.

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Personally I do not see how we could survive winning a third victory like the two previous ones.

I am sure we must be far more selective in the allocation of our national effort to military defence. We must pay far more attention to the principle of economy of force—and when I say "economy" I do not mean the false economy got by doing things on the cheap, but the economy which comes from efficiency, the economy which results from keeping every component part of the national war machine properly balanced in relation to the rest of the machine.

To Get Unity

What we must do is to discard quite ruthlessly ideas, traditions and methods which have not stood the test of economy.

Each of the fighting Services must go to the scientists and technicians for all they can possibly give in the way of speed, mobility, and economy, and develop the whole time with an eye on the other two members of the team in co-operation, not in competition.

Couple this with the mutual frankness and mutual faith which brought success in the war, and we shall get what we need, a united, efficient, and economical armed force; not an embryo Goliath which would take years to come to maturity after the outbreak of war, but a fully grown David, ready to act swiftly and decisively as one of the world's policemen.

The Influence of Air Power on Modern Warfare

I want, in the light of the experience we have gained during the last war, to try to clear our minds as to the influence of air power on modern warfare. In the past, so long as we maintained command at sea in war time, we were covered, not only against the major threat of the severing of our supply lines, but also against the other threat of invasion. Traditional methods were, however, no solution to the problem that faced us when the Germans developed the submarine campaign in 1917. Still less were they a solution for the even more dangerous problems of this late war. Impinging upon, and gradually percolating throughout, sea power, there was now the new factor—air power.

Sea power remained, as it still remains, vital to our very existence, but the forces required to exercise sea power had changed in character.

We were to find out, in the hard school of war, that air superiority is the prerequisite to all warlike operations, whether at sea, on land or in the air. In other words, in order even to begin to wage war successfully, it is necessary to arrive at the situation in which the enemy air opposition is unable to interfere effectively with our own operations—that is what we mean by air superiority.

Opening Moves

The opening moves of the air/sea war in 1939 were in accordance with the best naval tradition. On the first day of the war photographic reconnaissance of the German Fleet was carried out by one R.A.F. Blenheim, and the following day, in bad weather, a force of 29 R.A.F. bombers attacked enemy warships lying off the entrance to the Kiel Canal. Between then and the end of the year four more daylight bombing attacks were carried out against the German Fleet. The numbers of aircraft available were small (the largest raid was the first) and the losses, mostly at the hands of enemy fighters, were heavy—between 25 per cent. and 50 per cent.

In the meantime the enemy had carried out similar operations against our naval vessels at Rosyth and Scapa, which were likewise ineffective and expensive. Our operations against the German Fleet showed the need for one change in our technique. Our heavy casualties proved that unescorted bombers were very vulnerable to fighters, and from that time on, till late in the war, the bulk of our bomber operations over Germany were at night.

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Superiority

Germans had simple formula for it

The fight for air superiority is not a straightforward issue like a naval battle or a land battle; it is a campaign rather than a battle, and there is no absolute finality to it as long as any enemy aircraft are operating. I think that one reason why people have found it difficult to understand is that it is most effective when the operations to secure and maintain superiority are not visible to those who are benefiting from it. The Germans had, at the beginning of the war, a simple formula for getting air superiority at the very outset. The initial blow in a campaign was an all-out surprise attack, by bombers, dive bombers, and fighters, on the opponent's air bases, sometimes accompanied by parachute and airborne landings; the second stage was destruction of the aircraft factories. This formula worked to perfection in Poland, and again both in Norway and in Holland.

The Real Test

When they followed the same formula against us in Northern France surprise was lacking, but they inflicted considerable losses in one or two instances, since our airfields had only light defences and the warning organization was inadequate. The real test came, however, with the opening of the Battle of Britain. Airfields and radar stations were their targets in the first round. At three or four airfields more or less serious damage was done, though few aircraft were destroyed. There were, however, ample alternative airfields. The organization for warning and control of the defence was efficient, and the proportion of successful interceptions was high. Moreover, the British fighters were superior in fire power and speed. Enemy losses were severe.

Attacks on Docks

Then, though it must have been clear that our fighter defence was still fully effective, the Germans proceeded to the next step in their plan—the docks and ports. Then some spasmodic and ineffective attacks on airfields farther inland and a few attacks on aircraft factories. These stages in the German campaign were not really in accord with the formula for air superiority which had been so successful before. Still less so was the final stage of wholesale attacks on London. The original formula provided for the gaining of absolute air superiority as the essential first step, by knocking out the opposing air force first on its airfields and then in its factories. But, against Britain, the Germans failed to persist in these first-phase operations. As a result the fight for air superiority was fought in the air.

But the enemy were, in fact, not equipped or trained to fight for air superiority. The Battle of Britain was lost and won before they could rectify their mistake.

In Greece

Our airfields were too small

The campaign in Greece and Crete is a vivid contrast. Our airfields in Greece were small and there were no engineers to enlarge them or to provide dispersal or protection; there was no effective warning organization and virtually no A.A. defence. Under such conditions the normal German formula worked like a charm.

"Half-moon" Plan

For the attack on Crete the Luftwaffe assembled on fields in Southern Greece and on the islands in a half-moon facing Crete. Operating in large numbers at short range from secure bases, it had complete air superiority in its hands, virtually without having to fight for it. In the Western Desert, where the numerical strengths of the opposing air forces were approximately the same, air superiority over the enemy was secured and maintained by a wide and constantly changing variety of operations which were never entirely relaxed. Air superiority is a subtle question; before one has seen the results which flow from it I think one can only sense it. I could not help feeling a certain sympathy in the earlier days for my soldier and sailor colleagues, who could not

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understand why, before their operations began, I could only say I "thought" and "felt" the air situation would be all right, and would give no precise guarantees.

SICILY
Preceded by six weeks' air operations

The invasion of Sicily was a typical case in point. The intensive preparatory air operations went on for some six weeks before D Day. Despite the thorough way in which our attacks had covered their targets, one could not help wondering if, when the show-down came, we should find that we really had done the job. It would have needed only a small surviving enemy force to do immense damage during the initial landings. The fact that when D Day came we found the enemy air forces had been paralysed is a matter of history.

COMPLETE MASTERY

There was a similar element of the unknown prior to the landings in Normandy. Prior to D Day it was estimated that the Luftwaffe would carry out between 600 and 700 sorties per day over the landing area, whereas they were unable to maintain an average of more than 200. In the final stages of the European War the Western Allied air forces had almost complete air superiority over the Reich. Step by step, after losing the Battle of Britain, the Germans had been forced on the defensive, and they never regained the initiative. More and more was their effort diverted to passive defence—fighters, A.A. and radar defences, A.R.P. measures, etc. More and more did their bombers—the dynamic element in their air force—fade away. As a German staff officer expressed it at the beginning of 1944, "The decisive battle with the Anglo-American air forces is being fought out over our vital living space." I emphasize this point because it is a principle fundamental to any understanding of air power.

VITAL TO DEFENCE

An air force comprised of fighters alone is not an air force and it is not a defence. As well have naval ships without guns, or armies without artillery. The fighter and the bomber, the guard and the punch, are complementary. The bomber operations, though unseen, are absolutely vital to the defence of the country.

AIR FUTURE
Problem of greater bomber speeds

Are future developments likely to affect the principle? In my view all the possible developments we can now see only serve to reinforce the principle. Very greatly increased bomber speeds will immensely increase the difficulties of providing adequate warning and effective interception, and indeed the fighter's superiority of speed over the bomber (upon which its effectiveness in defence primarily depends) may well dwindle almost to nothing. The most effective defence against air attack is to stop it at its source, and in future it may become the only way; it is certainly the only method of dealing with the rocket.

The only decisive air superiority is that established over the enemy country.

It is remarkable that, despite the clear lessons of the Battle of Britain, Germany embarked on the Russian war with her air policy unchanged. No serious attempt was made to increase aircraft production or press on the development of new types.

MORTAL BLOWS

By the end of 1942, at Stalingrad and in the Mediterranean theatre, the Luftwaffe had suffered blows from which it never recovered. In a desperate and futile attempt to relieve von Paulus's army at Stalingrad the Luftwaffe was recklessly, and, I feel, ignorantly, flung into an operation for which it was quite unsuited. In the Mediterranean theatre, Kesselring was frittering away the Luftwaffe's dwindling stock of trained and experienced aircrews in a series of ineffective and dispersed operations. It is true he gave us a headache at Malta, but it cost him dearly and he got no long-term dividends.

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Oil Shortage

How it limited German air operations

When an air force is facing heavy wastage in war, it depends for its continued health and morale on a high standard of training by first-class, experienced instructors. The Luftwaffe suffered in both quality and quantity. The experienced aircrews, who should have been used as instructors, were thrown away in profitless operations, and shortage of oil curtailed training more and more until, in 1944, even operations in the field were being limited by oil shortages.

Luftwaffe Grounded

The Allied offensive against the German synthetic oil plants in the spring of 1944 had catastrophic results, and by the spring of 1945 all remaining fuel stocks were exhausted, distribution had stopped owing to the paralysis of transportation, and the Luftwaffe was grounded. The German Air Force was ultimately beaten on all counts; in command and direction, in stategy and tactics, in technique and morale, in quality and quantity; but it was not a quickly won or easy victory. One sometimes hears it said that the air battle must be won first, before land or sea operations can take place. That can be misleading; air superiority must be established, and the greater the degree of that superiority the better, but the air battle is continuous, and when it is won the war is all but won.

Has the airplane made the battleship obsolete?

The initial air exchanges at Scapa and Kiel in 1939, ineffective though they were, were the writing on the wall. Air power was clearly going to have a real influence on the exercise of sea power. The German occupation of Denmark and Norway provided some bitter lessons for us, but almost certainly the Germans failed to notice, in the British air operations, a particular warning, perhaps only a hint, for the future.

Four nights after the German initial assault Bomber Command laid mines in the Great Belt; a small operation which so far as we know paid no direct dividends, small as a cloud the size of a man's hand—but, fortunately Britain learned the lesson.

Movement Stopped by Air Attacks

Four and a half years later, when the enemy urgently needed to withdraw divisions from Norway, special shipping was allocated for troop transport across the short sea passage from Oslow to Northern Denmark; enough ships were allocated to move between two and three divisions a month—in December, 1944, 14 ships had been detailed for the job. By March, the actual rate of movement, thanks to the losses imposed by air attack and air mining, had dwindled to barely a division in six weeks, and by April the movement was negligible.

This was air power overriding sea power with a vengence.

Out of a total of 2,471 enemy ships sunk and damaged in Northern European waters throughout the war, 289 fell to surface and under-water vessels, and the remainder—over 88 per cent.—to aircraft (either by direct attack or by air/sea mining). It is of interest to note that the major contribution was made by mining in the Kattegat, Great Belt and Baltic, by Bomber Command—the small cloud had grown!

"The Miracle of Dunkirk"

When, at the end of May, 1940, the German Army and the Luftwaffe had penned the British Expeditionary Force and a fragment of the French Army up against the coast round Dunkirk, there appeared no choice but surrender or annihilation. Yet, compounded out of the stubborn courage of the B.E.F., the gallantry of the Royal Navy and of the crews of that fantastic amateur fleet which emerged from the rivers and seaside resorts, and the determined air offensive by the British aircrews, finally there emerged the "Miracle of Dunkirk."

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In eight days 316,663 troops were evacuated from crowded beaches. The pilots and aircrews of Fighter Command, Bomber Command, Coastal Command, and the Fleet Air Arm during those critical days established a moral ascendancy over the enemy which did much to outweigh the enemy's numerical advantage; and, fighting to a large extent out of sight behind the enemy lines, they saved the beaches from becoming a shambles.

Three years later, at Tunis, a similar situation arose; but the boot was on the other foot. This time the defeated army was German and Italian. It, too, wished to get home, and it, too, had to cross the sea to escape. There, also, the victorious side had air superiority. But there the analogy breaks down. Long before the final battle of Tunis was over on the ground, the Allied Air Forces had begun to spread the tentacles of air superiority across the Sicilian Straits, over the Sicilian airfields and ports. Seaborne supply to the armies in Tunisia had become almost impossible by April; evacuation by sea, except for a few handfuls by destroyer, became hopeless. Finally, even destroyers came to grief, and there were desperate attempts to evacuate by air. The final stages became to the Allied air force almost like a rat hunt. During April alone some 200 enemy air transports were destroyed.

Here, in this climax of the African campaigns, was air power denying sea power to the enemy.

This, however, was only the climax. Throughout the whole of the Mediterranean campaign from 1940 till mid-1943 there was one dominating theme—to secure freedom to use the sea routes through and across the Mediterranean.

Keeping the Sea Routes Open

The Axis requirement was to be able to use the sea routes across to Africa so as to supply the armies which alone could finish the job of clearing us out of Egypt. Our requirement was to keep the route open from Gibraltar, through Malta, to Egypt. The Axis problem was simpler than ours, since the sea routes they needed were far shorter and far less exposed to attack—except from Malta. Our problem was difficult, because we only held points at each end of the 1,700-mile route and one point—Malta—at the centre. The key to our position in the whole Mediterranean lay in Malta. Three times, when the use of Malta seriously threatened the maintenance of the Axis effort in Africa, did the Germans try to neutralize it by direct attack. Three times they failed to get that ultimate degree of air superiority which would have enabled them to deliver the *coup de grâce*. As a result of the last of these German onslaughts on Malta Rommel succeeded in getting his supplies, and our desert offensive was turned into a retreat, which, but for our air superiority, might well have been a rout, and which only stopped at Alamein.

Egypt and Malta Were in Jeopardy

The danger then was twofold; both Egypt and Malta were in jeopardy—Egypt from direct invasion and Malta from starvation. The escort vessels also suffered. With our air forces back behind Alamein, any possibility of getting a convoy through to Malta had gone. Malta's situation as regards both military supplies and food daily became more critical. Thanks largely to the Malta-based attacks, Rommel, however, also was starving, especially for oil. It was touch and go whether our assault at Alamein and our subsequent Army advance could be staged in time, and with sufficient speed, to give us the use of the airfields in Cyrenaica so that we could cover a relief convoy to Malta before it was too late.

We just succeeded. The day our Army reached Tobruk the convoy for Malta sailed from Alexandria, and when it passed the bulge the following day our fighters were operating from airfields in the bulge. The convoy got through untouched and Malta was saved.

During the last quarter, from August to November, 1942, 205,000 tons of Axis shipping was sunk, 35 per cent. by submarine, 61 per cent. by air action. The land campaign in North Africa was, in fact, and continued to be, a fight for air bases. The capture of Crete was a further example of air power overriding seas power; sea power

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was virtually helpless. This gives rise to the question—and it is one of utmost importance to the security of Britain—whether the possibilities of airborne invasion vitiate sea power as one of the main pillars of our security

In considering this question, one must realize that an airborne force is extremely vulnerable while in the air.

Without complete local air superiority an airborne operation is literally not feasible, and even with air superiority the losses may be prohibitive. It must also be remembered that an airborne force, once landed, is, sooner rather than later, dependent on normal supply and support by land and sea.

Why Arnhem Did Not Succeed

One of the reasons for the partial failure of the Arnhem operation was the inability of the supporting forces to fight their way through to join up in time; and the heavy losses in the final stage were due to attempts to re-supply by air after the initial surprise had passed away. Moreover, the actual staging of an airborne operation is an extremely complicated business.

This is demonstrated by the fact that before Arnhem no fewer than 15 airborne operations were successively planned and their preparations started, which had, one after the other, to be shelved because they could not be got ready in time—events on the ground had moved too fast.

During most of that time the bulk of the air transport force was immobilized preparing for operations which never came off. In the Normandy landings nearly 1,500 transport aircraft and 860 gliders were employed. At Arnhem the numbers were greater still; no fewer than 2,500 gliders were employed.

Sea Still a Security Factor

Each one of these airborne attacks made great contributions to the success of the main operations on land, but when one remembers what they involved in the aircraft, special material and training needed in order to cross the water—in order to side-step sea power by using air power—one gets a useful reminder of the fact that the sea is still a very real factor in security.

In short, so far as the security of these Islands is concerned, sea power under cover of air power still has its place; the great bulk of any attempted invasion must still come by sea.

Nearly 9,000,000 tons of Japanese shipping was out of action at the end of the war, either sunk or seriously damaged. After April, 1945, 50 per cent. of all ships sunk or damaged were victims of mines dropped by B.29s—an interesting comparison with Bomber Command's results against German shipping. It is important to note that it was aircraft and submarines that claimed most of the big warship victims on both sides during the war. The inevitable questions are being asked:—

Does the big ship principle still apply under modern conditions?

Have aircraft and submarines defeated the unsinkable battleship of which we were told before the war?

These are not questions to be lightly answered in either sense. Big issues are involved and calm, unprejudiced judgment is needed. All I would venture to say on this issue is that we cannot afford to make the wrong decision. We are unlikely again to be given the time to correct a mistake; we must be ready for the future, not the past.

We must have air power!

There have been some enthusiasts who have stated that air power can by itself win wars. As regards the late war, it is clear that we did not attempt to win by means of air power alone—or even by air power as the primary factor. Of the direct war effort of the nation, the Army accounted for about half, the Air Force just over a quarter, and the Navy just under a quarter. Civil Defence absorbed about 3 per cent. The bomber force itself took approximately 12 per cent. at the peak, and, over the whole war, 7 per cent. of the direct war effort of the nation. The bomber offensive against

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Germany passed through many different phases, but is was frequently checked by the diversion of the bomber force to defensive tasks. We now know that the German economy was, in fact, not stretched until 1944; but that does not by any means imply that our air attacks up till then had failed to affect the German war effort.

Weight of Attack

In 1943 a force of more than 600,000, and in 1944 nearly 900,000, were maintained in Germany to man the A.A. defences—not far short of the peak total strength of the R.A.F. all over the world. Up to the end of 1943, judged purely by war production figures, it would appear that the attacks on neither of the two main target systems—the industrial towns and the German aircraft industry—had achieved their primary object of "the progressive destruction and dislocation of the German military, industrial and economic system and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened." This is, however, by no means the whole story. In the first place we must remember that the total weight of attack during the first four years of the war was considerably less than that dropped in the five months in 1945. Next, and of paramount importance, were the firm foundations to air superiority which were laid during this phase—the vital factor affecting the whole latter course of the war. The air war was being fought out over Germany and not over Britain.

Two Main Targets

Early in 1944 the projected land assault on Europe began to take absolute priority over all other military operations. The question now was how could air power best be exercised to assist the assault? Apart from that, and from purely tactical short-term support (the "softening" operations), there were two main target systems selected—oil and communications. The second of these covered, of course, the transportation system upon which the movements of the enemy reinforcements would depend. The plan called for attacks on 79 rail centres in Northern France and Belgium and 14 in South-Eastern France. The attacks began on March 6th, and were completed shortly before D Day. Of the total of some 67,000 tons, 45,000 were dropped by Bomber Command in a series of highly-concentrated and extremely accurate attacks.

Utterly Disorganized

By the end of May traffic entering Northern France from across the frontiers was barely 20 per cent. of its February level. In France as a whole traffic was down to 50 per cent. in May and by D Day 30 per cent. of its normal volume. German troop movements were utterly disorganized. In two and a half months these attacks had virtually paralysed the railway system in France and Belgium. They were without doubt the really decisive factor in enabling the Allied armies to establish themselves on the Continent of Europe. The bombers were able to give further direct assistance to the fighting on the ground.

Explosive Deluge

Before any Allied advance the Germans facing the advance were smothered in a sudden deluge of high explosive from the air—as much as 7,000 tons of bombs in half an hour. As Rundstedt put it, it was "all a question of air force, air force and again air force;" or more calmly:

"The main difficulties which arose for us at the time of the invasion were the systematic smashing of the main lines of communications, particularly the railway junctions. We had prepared for various eventualities . . . that all came to nothing or was rendered impossible by the destruction of railway communications, railway stations, etc. The second thing was the attack on the roads, on marching columns, etc., so that it was impossible to move anyone at all by day, whether a column or an individual, that it to say carry fuel or ammunition. That also meant that the bringing up of the armoured divisions was also out of the question, quite impossible. And the third thing was that carpet bombing. . . . . Those were the main things which caused the general collapse."

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S.O.S. to Hitler

Germany had always been very near the safety margin as regards oil fuel, especially aviation petrol. By the end of September, 1944, more than 60,000 tons of bombs had been dropped on oil targets in greater Germany. In June, 1944, Speer, in an urgent personal letter to Hitler, reported loss of aviation fuel up to 90 per cent. and emphasized the need for rapid repair and increased protection. "Otherwise," he said, "it will be absolutely impossible to cover the most urgent of the necessary supplies for the Wehrmacht by September. In other words from that time onwards, there will be an unbridgeable gap which must lead to tragic results."

It did.

Paralysis Spread

The true pattern of the Allied air offensive was now becoming visible. Oil and communications were not alternative target systems, they were complementary, and together they were the one common denominator of Germany's whole war effort. The paralysis spread. On 15th March (more than a week before the land assault across the Rhine) Speer reported to Hitler:

"The final collapse of the German economy can be counted on with certainty within four to eight weeks. . . . After this collapse even military continuation of the war will become impossible."

Here was economic warfare driven home to the point of economic collapse, and with it political and military collapse. This was the unseen war. I do not mean to suggest that this utterly decisive result was achieved entirely by air power. It was the capture of airfields in Italy that brought the oil plants in Hungary, Austria, Rumania, etc., within effective range of the Mediterranean air forces. The freeing of France and Belgium, by enabling us to advance our navigation aids on the ground, made possible a greater degree of accuracy in attacks deep in Germany, and by depriving the enemy of warning and defence in depth helped the Allied air forces to obtain a higher degree of air superiority. Loss of occupied and other territories to the Allies in the West and in the East itself involved a loss to Germany of her armament production which has been calculated as being as much as 13 per cent. in the first quarter of 1945.

Vital Air Power

But one can sympathize with Rundstedt in his summing up on the failure of the Ardennes offensive—"The root of the whole trouble was air power, air power."

I am utterly convinced that the outstanding and vital lesson of this last war is that air power is the dominant factor in this modern world, and that, though the methods of exercising it will change, it will remain the dominant factor so long as power determines the fate of nations. I believe that sea power is still vital to our very existence, and I am sure that sea power, properly exercised, can still be one of the keys to our security and not merely a commitment. I also believe that, in view of the inevitable dominance of air power, purely passive defence would be certain and painful suicide; it is peace with teeth, and the teeth must be able to bite hard and swiftly.

In 1941 General Smuts spoke of air power as "the air, the architect of victory." Properly understood and used, I believe it can be the guardian of peace until that happy day when nations realize finally that wars don't pay.

The End

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Strategic Air Bombardment

(Continued)

By J. M. Spaight, C.B., C.B.E.

THE GROUNDING OF THE LUFTWAFFE

The Luftwaffe's Fate

THE mighty German air force of 1939, a force three times as strong as ours in Britain at that time, was, literally and figuratively, down and out before the end of the war in 1945. Yet, paradoxically, it was still a very powerful force. It was actually larger than it had been in 1939. It had 5,000 first-line aircraft in the early spring of 1945, but it was a useless, impotent, grounded force. It could not do its job. How did that happen? The way it *ought* to have happened if the story of air power and the cities had gone according to the book of words was this: the Allied air forces should first have written off the German air force, should have driven it from the sky, should have wrecked its bases, depots and factories, and then, free of the air, should have proceeded to play havoc with the German towns. It did not work out like that. The *Luftwaffe was* grounded; of that there is no question; but it was not grounded according to the book. Something went wrong. Because it did, a legend sprang up, as is explained later. The legend followed the book; it said that the Allies first put the *Luftwaffe* out of action, and that then all else followed; but the reality differed from the legend materially.

To understand both the reality and the legend one should know something of the broad set-up of the German aircraft industry during the war. It was by putting that industry out of action that, according to the legend, the Allied air forces achieved supremacy in the air. It was because, in reality, it was not put out of action, mainly because of its lay-out, that Germany was still producing machines on a great scale almost until the end of the war.

The German Aircraft Industry

Germany, like Britain, relied for her aircraft supply upon private enterprise. Design and production were in the hands of half a dozen big firms, already world-famous before the second great war. They bore the names of eminent engineering professors and technicians, not militarists and not Nazis; indeed, one or two of them hated the Nazis like poison, but they worked for Goering, nevertheless.

One of them was Professor Hugo Junkers. An account of this remarkable man will be found in the book, *The Rise and Fall of the Luftwaffe*, by Hauptmann Hermann, the pen-name of a refugee German who had been his pupil and remained his fervent admirer. It nearly broke Junkers's heart that the machines which he had meant for the uses of peace should be perverted to those of war. The Junkers firm had its headquarters at Dessau and branch factories in three towns west of that city—Aschersleben, Bernburg and Halberstadt, and had other plants in Leipzig and a few other places. Its output of bombers and transport aircraft was enormous.

Another professor was Dr. Willy Messerschmitt, the designer of the famous Me 109 fighter. The Messerschmitt works were mostly in Bavaria and Austria, at Augsburg, Nuremberg, Regensburg, Wiener-Neustadt and some other places. Messerschmitt fighters were also built by the Gerhard Fieseler Werke at Kassel, in addition to their own "Storch" observation planes, and by the Gothaer Waggonfabrik A.G., at Gotha.

Dr. Claude Dornier's name was another famous one in the aircraft industry. The Dornier works were at Friedrichshafen on Lake Constance, at Munich, and at Wismar, on the Baltic. We were unpleasantly familiar with their products in 1940-41. Other unwelcome visitors at that time were the bombers of the great combine called after Dr. Ernst Heinkel. His firm's works were situated on the Baltic, at Marienehe and Warnemünde, both near Rostock, and at Travemünde, near Lübeck, and in Tyrol, Poland and Austria. There was an associated company at Oranienburg, north of Berlin.

Near Berlin, too, at Schönefeld, were to be found the main works of another well-known firm of constructors, the Henschel Flugzeugwerke A.G., a branch of the great combine of Henschel und Sohn, of Kassel, builders of locomotives, lorries and armoured fighting vehicles. Yet another giant concern better known for its other products, Blohm und Voss, the world-famous ship-builders of Hamburg, had also an aircraft division, which specialized in marine types, but built other machines as well during the war. The Arado Company, whose works were at Brandenburg and Warnemünde, built mainly training aircraft, but had a factory making components of F.W. 190's at Anklam, Pomerania.

A Peripatetic Factory

Finally, there was the Focke Wulf Flugzeugbau A.G., the constructors of the most successful Ger-

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man fighter, the F.W. 190, designed by Kurt Tank, and the big four-engined F.W. 200, which was used for attacking our convoys at sea. Their chief works were at Bremen and at Johannisthal, a suburb of Berlin. The Bremen factory had an unsettled and unhappy career. Its life story was told in an Air Ministry Bulletin of 10th June, 1945. It was largely destroyed by Bomber Command in 1941, was evacuated to East Prussia, was there destroyed by the 8th United States Army Air Force, was rebuilt, was destroyed again, was evacuated back to Bremen on the approach of the Russian armies, and was wrecked again by our bombers when it got there.

Bremen, Hamburg and Kassel were unhealthy sites, but most of the aircraft factories, it will be seen, were so located as to be screened by distance from our bombers' too assiduous attentions. They were well dispersed. They were more spread out than our own key plants, which were concentrated to too great an extent in Coventry and Birmingham in the early part of the war. The German aircraft industry was more fortunate, too, than the German synthetic oil industry, a substantial section of which was established in the Ruhr, and the transportation network, which, again, was especially vulnerable in the western marches of the Reich. The Nazis were wise in their generation when they sited their aircraft plants.

The Aero-Engine Factories

The German aero-engine factories were also well distributed. The standard engines of the *Luftwaffe* were the B.M.W., the Daimler-Benz and the Junkers Jumo. The first was manufactured by and named after the Bayerische Motoren A.G., of Munich, which had factories at Brandenburg, Spandau, Basdorf and Vienna, with a shadow factory at Hamburg. Daimler-Benz had its main seat at Stuttgart (Unterturkheim), and its engines were produced also by three shadow factories in Germany—at Brunswick, Mannheim and Kassel—and at two others at Wiener-Neustadt, in Austria, and at Rzeszow, in Poland. The Jumo engine was a product of the Junkers Flugzeug und Motorenwerke A.G., with headquarters at Dessau and plants there and at Magdeburg and Munich and in Austria. There was also a shadow factory making Jumo engines at Leipzig. Another aero-engine, not so frequently mounted, was the Argus, manufactured by the Argus Motoren Gesellschaft, at Reinickendorf, a suburb of Berlin, and at the former Walter works, at Prague.

The Legend

Clearly, the task of knocking out an aircraft industry so widely dispersed was a formidable one which needed time for its execution; yet, according to the legend already referred to, it was accomplished in a few days. The story was that in one fateful week in February, 1944, the Allied air forces shattered Germany's power by a tremendous onslaught on her fighter aircraft factories and assembly plants. "Five Days which Broke the *Luftwaffe*" was the banner headline of a Press report of this achievement. The attack, we were told, was one of the decisive actions of the war, as decisive at Gettysburg, in 1863. It put the *Luftwaffe* out of the running in the air war, once and for all.

Already before that week of February there had been a number of raids upon the enemy's aircraft plants. There were attacks by the 8th United States Army Air Force in 1943 on those in Bremen and Kassel, and by the 9th Air Force (from the Middle East) and General Spaatz's North African Air Force on the Messerschmitt assembly plant at Wiener-Neustadt. The ball-bearing industry was also attacked. It was regarded, says the United States Strategic Bombing Survey, as a more profitable target than the airframe factories, being "concentrated in three cities, with the glittering prize of half the industry's total capacity located at Schweinfurt." Flying Fortresses of the 8th Air Force raided Schweinfurt on 17th August and 14th October, 1943, and severe damage was done to the plants in the latter raid; but it was a costly raid for the American formation, which was heavily attacked by German fighters and lost 60 bombers, or nearly 30 per cent. of its strength.

This unfortunate experience, the Survey states, led to the decision to try to reduce the fighter strength of the German air force at the first possible opportunity. Fighters were to be feared rather than flak. Bomber Command's losses in the first two years of the war had been distributed evenly as between the two kinds of defence. From 1943 onwards 75 per cent. of them were due to fighters and only 25 per cent. to the guns. The importance of making some inroads on the enemy's establishment of fighters was obvious, and in 1944 a determined effort was made for this purpose. On 11th January the 8th Air Force wrecked the Focke-Wulf factory at Oschersleben (west of Magdeburg), the Messerschmitt, at Brunswick, and the Junkers, at Halberstadt. Then, six weeks later, there came the momentous week which, it was claimed, ended for ever Germany's dreams of attaining the mastery of the air.

The February Week

The onslaught began on Sunday, 20th February, when bombers of the 8th United States

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Army Air Force attacked the aircraft assembly factories at Leipzig, Gotha and Bernburg, and the aircraft component factories at Brunswick and Leipzig. Plants assembling and constructing Messerschmitt and Junkers fighters were wrecked. Next day the aircraft factories at Brunswick were raided again. On 22nd February those at Bernburg, Oschersleben and Halberstadt were bombed by the 8th Air Force, while the Messerschmitt factory at Regensburg, in Bavaria, was attacked and heavily damaged by the 15th Air Force (from Italy), which followed up the attack next day by another on aircraft assembly plants at Styr, in Austria. On 24th February the 8th Air Force struck again at the Messerschmitt factory at Gotha, and also attacked the ball-bearing works at Schweinfurt (in the north-east corner of Bavaria). The latter works, particularly the Kugelfischer and the V.K.F. Werke I and II plants, were seriously damaged in that raid and in one by the Royal Air Force on the same night. On 25th February both the 8th and the 15th Air Forces attacked the aircraft factories at Regensburg, putting them completely out of action, and the former Force also raided the Messerschmitt works at Augsburg and other plants at Stuttgart and Fürth (west of Nuremberg). The Royal Air Force followed up the daylight raid on Augsburg by a heavy one on the same night, when two attacks were made with an interval of two and a half hours between them. The air raid alarms were destroyed by the first wave of our bombers, and the only warning of the second attack was the crash of the bombs themselves.

A large number of German aerodromes were attacked during the same week, and in the course of the raids heavy losses were inflicted on the *Luftwaffe* in combat and on the ground. On 20th February 126 enemy aircraft were destroyed, according to the American official report; on 21st February, 51; on 22nd February, 133; on 24th February, 156; and on 25th February, 142. The Americans' own losses were substantial, too, but not so heavy as the Germans'; but it was the wrecking of the aircraft factories that was the object in view, and this, it was considered, was achieved at a cost that was not undue. The result, General H. H. Arnold, the head of the United States Army Air Forces, stated in a report submitted to Mr. Henry Stimson, the Secretary of War, and made public at Washington on 26th February, 1945, was a disaster for the *Luftwaffe* from which it never recovered.

The Reality

Such was the account that held the field until the end of October, 1945. The report of the United States Strategic Bombing Survey then issued threw a new light on the effect which the attacks of February, 1944, had actually had upon the enemy's aircraft industry. It showed that the effect had been very considerably exaggerated. A substantial amount of damage was done and production was interfered with for a time, but there was far from being such a catastrophe for the enemy as had been imagined. The position with regard to output was rectified fairly soon. There was a 50 per cent. reduction in the Messerschmitt factories for a month, after which production was restored to normal. The losses at the eastern plants of Focke-Wulf were about 20 per cent. for a period of two months. The Heinkel factory, near Leipzig, suffered severely, the machine shop having been hit, but at the Gotha factory the loss of production was slight. On the whole, the aircraft industry weathered the storm fairly well and was very far from being sunk.

Recovery was remarkably quick. "During the five months after February, when the bombing attack was at its peak, aircraft output continued to grow," says the Survey already quoted. "In spite of the serious damage done by the February attacks, and by the continuing attacks thereafter, the recovery was exceedingly rapid. The number of planes turned out more than doubled in the five months from February to July, 1944; fighters increased by more than 160 per cent., and aircraft weight nearly doubled." In September, 1944, 3,375 fighter aircraft were produced, or more than double the number estimated by the Allied intelligence service at the time.

The reasons for "the enormous increase in production," as the Survey terms it, after February, 1944, were various. The organization of the industry had previously been inefficient, and this was being remedied just when the attacks took place. Thereafter there was better utilization of capacity. The bombing destroyed relatively few machine tools and the damage to the buildings failed to interfere seriously with the output. There was at the same time a shift from bomber to fighter production, and the resources needed for one bomber sufficed to produce three fighters. (Incidentally, the shift had the result that there were so many fewer bombers to attack our cities.) Finally, quality, or at any rate, finish, was sacrificed to quantity of production.

The Effect of the Raids

It is not to be assumed, however, that the attacks on the aircraft factories had no effect on production except the very temporary one referred to above. Undoubtedly they resulted in the *Luftwaffe* being left with fewer machines than they would otherwise have had. "It appears likely," says the Survey, "that the direct bombing

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of the aircraft industry during the thirteen months from August, 1943, through August, 1944, reduced total aircraft output by something like 5,000 to 10,000 planes below the totals that would have been reached in the absence of air attack. If this reduction had not occurred," it says later, "more planes would have been available for combat in the latter part of 1943 and the first few months of 1944, when the decisive battles for the control of the air were being fought. Gasoline for increased numbers of planes might then have been available, as stocks of aviation gasoline were actually increasing from the end of July, 1943, through April, 1944."

The attacks on the aircraft factories undoubtedly warded off a much larger increase in production which would otherwise have taken place. In 1942 the Germans had adopted a plan for the quadrupling of the monthly output of single-engined fighters by April, 1944. It went well for a time. By the end of July, 1943, the *Luftwaffe* had almost doubled its fighter force in the West and had more than doubled its monthly production capacity for replacement and accretion. After the onslaught on the factories in February, 1944, fighter production was forced back below the monthly production rate from which the plan started in 1942. The effect was thus to make that ambitious programme impossible of fulfilment.

There has also to be considered the strain thrown on Germany's economic resources by the necessity for dispersal or rebuilding of the aircraft factories that had been wrecked. A huge labour force had to be employed exclusively on repairing or reproviding the plants which were needed if even a show of activity in the air was to be maintained.

The Later Attacks

After mid-1944 the attacks on aircraft factories were of little value. It was aviation spirit, not aircraft, that was the limiting factor then. "The success of the attack on oil production," says the Survey, "had rendered superfluous any further attack on aircraft output." The offensive against aircraft plants was nevertheless maintained. It was carried on by the 8th Air Force from British bases and by the 15th from Italian. Bombers of the latter force were able to strike from Foggia at aircraft factories in Austria, such as Neustadt, Schwechat and Bad Voslau, and in neighbouring countries; the Ikarus-Belgrade factory in Yugoslavia, for instance, was effectively attacked. It is evident in the retrospect that this continued campaign against aircraft production was not very well advised.

It had, however, the incidental effect of enabling the American air forces engaged to destroy a large number of enemy aircraft on the ground and thus to deprive the *Luftwaffe* of equipment in being. It had thus a bearing on the issue of the struggle in the air in the later stages of the hostilities. The Survey states that the losses on the ground were very heavy, especially after mid-1944. It quotes an instance in which out of 1,000 planes produced by an aircraft factory, all but 92 were destroyed on the airfield after acceptance. "General Kreipe, air force representative on the General Staff, estimates that most of the fighters turned out in September, 1944, were destroyed on the ground." The losses in transit flight and at forward operating airfields were also heavy.

Aero-Engine Plants

Aero-engine plants would have been a more profitable objective than the airframe factories, but for some reason the Allies did not begin to attack the former targets on a large scale until March, 1944, though the raids on such industrial towns as Brunswick, Munich and Kassel, which contained engine factories, affected those factories incidentally. Aero-engines were a bottleneck in the system of supply of equipment; airframes were not. It was the opinion of the German experts, the Survey states, that if the same weight that was dropped on airframes had been dropped on engines, the recovery after February, 1944, would have been much more difficult, if not impossible.

A better target still, however, was the fuel which the engines needed to give them life. It was the great campaign against oil which contributed most of all to the putting of the *Luftwaffe* out of action. "From the point of view of grounding enemy aircraft," says the Survey, "the attacks on synthetic oil works were the most effective of all strategic bombing. After September the oil shortage made large-scale operations impossible." Each blow at an oil plant was worth many blows at aircraft or engine factories for the purpose of immobilizing their products.

A Dying Effort

The *Luftwaffe* used up some of its precious store of oil when it staged a large-scale attack on the British airfields in Belgium and Holland on 1st January, 1945. It caused us fairly heavy losses but it was a disaster for the enemy, 125 of their machines being brought down. The once mighty German Air Force had shot its bolt. Henceforth, though it made a dying kick or two, it was, in truth, only waiting for the end. It was still, numerically, a very powerful air force when the

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surrender came, and in jet-propelled fighters it was better equipped than was our Air Force or the American; but it was a useless force, for its life-blood had been drained away. After Goering had been captured by the American 7th Army, he stated in an interview at Augsburg on 11th May, 1945, that Germany had no lack of aircraft in the later stages of the war, but that she could not use them because of shortage of petrol and the narrowing down of bases (quoted in *The Times*, 12th May, 1945). The former reason would, by itself, have accounted for the grounding of the *Luftwaffe*. Mr. Churchill spoke on 29th November, 1943, of Germany's having in her air force a wasting asset. It took a long time, however, to waste away; what was more important was that, by the end of the war, it had become a frozen asset. That it was effectively frozen there is no doubt whatever. The way in which it was reduced to that state will be worth remembering and adapting to conditions in which some other kind of fuel may have become the motive power of flight, piloted or non-piloted.

The Japanese Parallel

The German air force, it has been shown above, had become an earth-bound one by the end of the war. A similar fate overtook the Japanese air force, mainly for a different reason, though it, too, was pinched for oil. Japan had still over 10,000 aircraft in the home islands at the time of the surrender, but her losses in air combat had been so catastrophic—they were more than 2,000 a month in the later part of 1944—that she practically abandoned the use of the aeroplane as an aeroplane and employed it instead as a missile. It was a characteristically Japanese way of attempting to redress the balance of fortune. She developed the Kamikaze technique, the suicide raid in which the pilot flew his aircraft directly into a ship, sacrificing his own life on the gamble that the ship might be destroyed too. A number of ships were destroyed, but none larger than an escort carrier; most of those sunk were destroyers. The adoption of such a desperate remedy was a confession of Japan's bankruptcy in the air, just as was Germany's resort to the flying bomb and the long-range rocket in 1944. Neither expedient could save the cities of the country which grasped at it from being ground to pieces under the hammer of real air power.

THE BATTLE OF OIL

Attacks on Oil, 1940

OIL targets were among the first objectives of Bomber Command when the strategic air offensive started in May, 1940. During the months that followed one finds frequent references in the official reports to raids on refineries and synthetic oil plants in Germany. They were directed, for the most part, at the plants in the Ruhr, but more distant oil targets were occasionally attacked. In August, 1940, for instance, our bombers raided the great Leuna plant at Merseburg; in September, the plants at Politz, near Stettin, and at Regensburg, on the Danube; in October, the Politz plants again. The last attack was reported to have been particularly damaging. The official account spoke of buildings gutted, of gaunt chimney stacks left standing among ruins, of widespread destruction.

The picture was too highly coloured. The damage done in these early attacks was consistently exaggerated. The *communiqués* and the statements of Ministers on the subject were altogether too unguarded. Already on 19th May, 1940, Mr. Churchill, who had lately become Prime Minister, stated in a broadcast: "Our heavy bombers are striking nightly at the tap-root of German mechanized power, and have already inflicted severe damage on the oil refineries on which the Nazi effort to dominate the world directly depends." On 21st September, 1940, Dr. Dalton, Minister of Economic Warfare, stated in a speech at Newcastle that ninety per cent. of Germany's synthetic production of oil and eighy per cent. of her oil refineries had been "hammered with devastating effect."

False Hopes Raised

On 27th October, 1940, again, the Air Ministry News Service issued particulars of the damage done to oil and other targets. The record was an impressive one. To illustrate the effect of the raids an instance was quoted of an American oil engineer who had just returned to his own country after being employed by an oil firm in Germany for fourteen years. "His return," it was stated, "had been made necessary because all the twelve plants of the firm which engaged him had been put out of action by the R.A.F. and there was nothing left for him to do."

The effect of propaganda of this kind was to raise false hopes and to cause bewilderment when, for no apparent reason, the attacks on oil ceased. As the *Petroleum Times* pointed out a year later, the oil offensive inaugurated with such a splash in 1940 practically petered out in 1941. The paper hinted politely that it had been a flop. "In our enthusiasm," it said, "there is little doubt that most of us have been prone to over-estimate the tactical power of bombing such objectives. . . . Perhaps encouraged by the over-glowing accounts of raging fires in Air Ministry *communiqués* so prevalent last year (1940), a sort

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of impression was produced among the British public to believe 'one bomb, one refinery.' "

The Exaggeration General

Actually, no serious injury was done to the German oil industry in that early campaign against it. The annual production of synthetic oil in Germany was 2.3 million tons at the outbreak of war. It rose steadily and was over six million tons at the end of 1943 (United States Strategic Bombing Survey, p. 75). The too-optimistic British reports were simply one example of a general tendency to over-estimate the effects of bombing at that time. We thought that our air attacks were already winning the war for us. "With help from you," Lord Lothian, our Ambassador, told the American people on 11th December, 1940, "we are confident that we can win, and win decisively, in 1942, if not before." The only possible way we could have won then, when Greece alone was with us, was by bombing. The extent of the damage and the number of casualties caused by air raids were magnified out of all proportion, not on one side only. We were horrified, for instance, by the fate of the 30,000 people who had "perished in the flaming ruins of Rotterdam," on 14th May, 1940. The number killed there, we now know, was less than 1,000. It was not in the reports of the bombing operations only that the tendency to over-estimate the losses was to be seen. We were all thrilled to hear of the huge losses of the *Luftwaffe* in the Battle of Britain. It did have heavy losses and it was well and truly beaten, but—one could not say this while the war was on—it did not lose as many machines as we thought it did: certainly not as many as the numbers reported at the time, 185 on 15th September, 180 on 15th August, 133 on 27th September, and so on. Those were the numbers claimed by our pilots to have been shot down, and claimed in all honesty and sincerity, but there could be no certainty about them pending comparison with the numbers written off in the (unpublished) enemy records. There is always a tendency to over-estimate such claims. It was much more marked on the German side. It was claimed that some of the German fighter pilots had each brought down more than three hundred aircraft. That was ten times the number which we claimed for Sailor Malan or Johnny Johnson; it was simply a fantastic exaggeration.

The Rationing of Truth

The fact is that we have not yet the truth, the whole truth, and nothing but the truth of the air operations of the war, and we had far less of the truth at the time. It would be hardly too much to say that we were stuffed with fairy tales; not so grossly stuffed as the Germans, for whose edification our fleet was sunk many times over, so that we were left with a *minus* balance of warships; but still stuffed. There was in the official reports and in the utterances of Ministers a good deal that had to be taken with caution. No doubt the statements were believed by those who made them—it was certainly so in Lord Lothian's case—but they were often objectively ill-founded. The reasons were partly that the facts themselves were obscure, partly that the truth could not always be disclosed with due regard to its effect upon morale. There was *suppressio veri* in plenty on both sides. The Germans never knew that their wonderful dive-bombers, the Stukas, were slaughtered in droves whenever they came up against our fighters. We did not know that our Battle bombers suffered a like fate at the bands of the German fighters. It was criminal to have exposed either the one or the other to fighter attack. That, however, we could hardly expect the authorities to admit even by implication in war time. Truth has to be rationed carefully in such circumstances.

A Change of Policy

In 1941, as already stated, the oil offensive petered out. The War Cabinet had evidently come to the conclusion that it was not paying dividends. There were other reasons, too, for the slackening of the attack on objectives in the German hinterland. In 1941-42 Britain was fighting for her life in the Atlantic. The battle there was the first of our pre-occupations. To have lost it would have meant disaster and defeat. Our bombers had to be called upon to assist the aircraft of Coastal Command and the Fleet Air Arm to help the Navy to overcome the danger that threatened us there. They were diverted to a substantial extent from the attack upon other objectives to targets the destruction of which had become vitally necessary if we were not to be throttled by the maritime blockade. Naval bases and shipyards, submarine pens and factories in which the engines and other parts of U-Boats were constructed or assembled became the most important objectives for the time.

The apprehensions felt about the battle of the Atlantic were reflected in a directive issued by the Combined Chiefs of Staff at Washington in January, 1943. In this top priority was given to air attacks on U-Boat construction yards. Next came the German aircraft industry, followed by transportation, and then by oil plants. The fifth item in the list was "other targets in enemy war

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industry." The modest place assigned to oil targets in this programme was some indication that the previous campaign against such objectives had not fulfilled expectations.

New Devices and Techniques

In 1943-44 we had the comfortable feeling that we were getting somewhere with the air offensive at last. Actually, we were not getting there nearly as fast as we imagined. Despite the tremendous onslaught on the industrial cities, German production was higher in the summer of 1944 than it had ever been; it reached its peak in July of that year, falling quickly thereafter. The great attack on industry was found, in fact, to be one of which the results were subject to a distinct time-lag. There was too much of delayed action about it. If the public were not aware of that fact, the Allied war leaders must have had an inkling of it, and that, no doubt, was why our bombing policy changed again in 1944. It swung back in the direction of the earlier offensive. The attack on specific targets such as oil plants and railway yards was resumed, and this time the results were very different from those achieved in the former campaign.

In the early days not only were the bombers too few and the bomb loads too small, but there were lacking the navigational and aiming aids which became available in the later stages of the war. Bombing had largely to be done in 1940-41 "by guess and by God," as the sailors say. Conditions were very different in 1944. New devices and new methods had come into use. The development of the radar systems known as "Gee," "Oboe" and "G.H.," which made it possible for the navigator to reach a precise aiming point in darkness, and "H2S," which enabled the bomb-aimer to see it then in a cathode ray tube screen, transformed the work of our bomber crews. They were helped, too, by the introduction of the new methods of operational control represented by the Pathfinder Force and the Master Bombers. These various improvements made it possible to attack oil targets with far greater accuracy and effectiveness than in the original campaign.

The Battle of Oil

The new campaign was started by the Americans in the spring of 1944. There were many competing claims upon the Allied air forces at that time and during the summer, when the operations in Normandy were in progress, but our own and the American bombers found time for some damaging raids on oil plants and depots in Germany and France, especially during August; the Americans made some particularly effective attacks in that month.

In September the campaign took on an increased intensity and from then until the end of the war it was conducted with an unremitting vigour that made the enemy's attempts to repair the ravages which it had caused a heartbreaking undertaking.

There were periods of special activity. One was from 11th to 13th September, 1944. Great formations of both the Royal Air Force and the 8th United States Army Air Force were in action on these days. There was another day and night of almost non-stop bombing on 21st-22nd November, and yet another on 29th-30th November. Usually the Americans undertook the long-range work, our own bombers confining themselves to the plants in the Ruhr, but the latter also went far afield now and then. They raided the synthetic oil plants at Merseburg, at Bohlen, at Rositz and at Zeitz, all near Leipzig, at Politz, near Stettin, and at Lutzendorf, in Saxony, in the period December, 1944 to March, 1945. Some of the plants were attacked repeatedly. That at Lutzendorf, for instance, was knocked to pieces by our bombers on the night of 14th March, 1945; it was then turned over to refining crude oil and had to be dealt with again on the nights of 4th and 8th April. The huge synthetic plant at Brux, in Czechoslovakia, which had already been attacked by American heavy bombers in May, August and September, 1944, was raided by our Lancasters and Halifaxes on the night of 16th January, 1945. The Zeitz plant, which had also been raided by the Americans already, was attacked by our bombers on the same night (16th January) and was completely knocked out; a month later it was still a mass of debris and no attempt had been made to repair it. Other synthetic oil plants successfully attacked, by American heavies from Italy, were those at Blechhammer and Odertal, in German Silesia, at Oswiecim, in Polish Silesia, and at Regensburg, in Bavaria.

The Germans showed an amazing capacity for repairing the damaged oil plants. The great plant at Politz, eight miles north of Stettin, was subjected to three major attacks by our bombers. They put it completely out of action on the night of 13th January, 1945, but within three weeks it was patched up and working again; so the Lancasters had to return to it on the night of 8th February, and this time they did the trick. The other big plant in Germany, Leuna, at Merseburg —only Brux, in Czechoslovakia, was larger— was still more difficult to put out of action. The United States Strategic Bombing Survey states (*Summary Report*) that it was attacked no less than twenty-two times in 1944-45—twenty times by American and twice by British bombers. It

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was restored to partial production after each attack and was still utilizing 15 per cent. of its capacity in January, 1945. The ten plants in the Ruhr proved almost equally recalcitrant. What hard nuts they were to crack is evident from the number of major attacks which had to be made upon them and in each of which five hundred tons or more of bombs were dropped. Homberg (on the west bank of the Rhine, opposite Duisburg) had eight such attacks, Wanne-Eickel, seven, Scholven-Buer, six, Kamen (Dortmund) and Sterkrade, five each, Bottrop, four, Nordstern (the largest Ruhr plant) and Kastrop-Rauxel, two each.

The Assault on Refineries

The Germans obtained their motor and aviation spirit in three ways: by synthesizing coal, by refining crude oil, and by producing benzol as a by-product of coke. The story of the assault on the synthetic plants has been summarized above. The attacks on refineries and benzol plants were equally successful. The most important of the refineries were those at Ploesti, in Rumania, which, when fully working, supplied about one-third of all Germany's oil. They were raided by Liberators of the 9th United States Army Air Force from the Middle East on 1st August, 1943, when a very damaging attack was made upon them from low level, and subsequently on a number of occasions by the 15th Air Force from the Mediterranean. As a result, their output had been reduced to 15,400 tons a month, as compared with 155,700 tons in March, 1944, before they were overrun by the Russian army on 30th August, 1944. In addition to the attacks on Ploesti, the Mediterranean *communiqués* spoke of others on refineries in Czechoslovakia and Austria in March, 1945, but that Command does not seem to have distinguished very carefully between refineries and synthetic oil plants.

The 8th United States Army Air Force, from its English bases, raided refineries deep in Germany, such as that at Rositz, near Leipzig, while Bomber Command attacked others ranging from Heide, in Schleswig-Holstein, to Molbis, also near Leipzig. The two most important refineries in Germany, the Rhenania and Ebano, at Harburg, a few miles south of Hamburg, were also attacked by our bombers and heavily damaged on the nights of 11th November, 1944, and 7th March, 1945. The Rhenania plant was raided again on the night of 4th April. The result of these attacks was that some 53 per cent. of the built-up area of Harburg was destroyed. Another large refinery, that at Misburg, near Hanover, was badly crippled in a big raid by the American Flying Fortresses and Liberators on 26th November, 1944, and was finally knocked out by our Lancasters on the night of 15th March, 1945.

The Attack on Benzol Plants

So effective was the Allied assault on the other —the main—sources of supply that the Germans were driven back on the third, the benzol plants, in their desperate need for liquid fuel. They had no alternative but to maintain coking and tar-distillation plants which would otherwise not have been worked but had to be kept in operation for the sake of the benzol which was produced as a by-product. It was a most wasteful and uneconomic way of getting oil. Coke was, of course, the main product of the coking plants, and for coke there was very little demand in the latter half of 1944, when the steel plants of the Ruhr had largely been reduced to idleness because of the lack of manganese, chrome and other metals needed for making alloy steel. Vast quantities of useless coke piled up in order to give a small return of benzol motor fuel. On the average, a coking plant produced about 1,000 tons of benzol a month, as compared with a normal output of 7,000 tons a month from the smallest of the synthetic oil plants of the Ruhr. Only dire necessity could justify such a method of obtaining fuel.

Naturally, the British and American bombers turned their attention to the benzol plants, and in the closing months of 1944 and the first quarter of 1945 they put most of them out of action. The plants were almost wholly in the Ruhr, which produced 64 per cent. of Germany's total supply of benzol. The Almo-Pluto and Dahlbusch plants, at Gelsenkirchen, the Gneisenau and Hansa plants, at Dortmund, the August Viktoria, at Huls, the Robert Muser, at Bochum, the Bruchstrosse, between Bochum and Dortmund, the Ewald Fortsetzung, at Recklinghausen, the Bruckhausen, at Hamborn, the Matthias Stinnes, near Bottrop, and others, at Kastrop-Rauxel, Scholven-Buer, Osterfeld and Datteln, were all heavily attacked in the last months of the war. Benzol production went the way of synthetic oil and refining, and Germany's last hope of escape from air power's stranglehold on her liquid fuel supplies was shattered.

Decisive Battles of the Air

There were three decisive battles of the air in the war with Germany: those of Britain in 1940 and of oil and of transportation in 1944-45. The first made it impossible for the Germans to invade this country. The second and the third made it impossible for them to resist success-

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fully the invasion of Germany. The battle of transportation, as is shown in the next chapter, was the final blow to Germany's hopes of stemming the Allied advance in the closing stage of the war. The battle of oil drove another nail into her coffin. That was to be expected. The campaigns against oil and against transportation were complementary. The disruption of the railway network would not have mattered so much if reinforcements and supplies could have been moved by road. The magnificent *autobahnen* of Germany were built for that purpose. They became useless when there was insufficient oil to move transport over them. The Germans had to rely upon their railways almost entirely, and that was why the attack on transportation was the decisive blow which it was. It would not have been so shattering if it had not been accompanied by the blow at oil. The two blows were irresistible.

Some Notable Testimony

"The effects of the oil shortage on Germany's war effort were greater than the advocates of oil as a target had dared to predict," says the report of the United States Strategic Bombing Survey. How the shortage crippled the *Wehrmacht* is evident from General Eisenhower's testimony. In his report on the operations in Europe from June, 1944, to May, 1945, he refers to the serious repercussions which the bombing of the German refineries and synthetic oil plants had upon the land fighting, and not upon that alone. He states that as a result of the intensive air attack which began in April, 1944, production of oil had fallen by December to 30 per cent. of the previous capacity, and goes on:

> "This 30 per cent. was produced as the result of herculean efforts which diverted manpower and labour teams from other equally essential industries, such as, for example, the production of the new and ingenious weapons with which Germany hoped to decide the issue of the conflict. The subsequent shortage of oil brought on by our operations contributed to the complete collapse of the German bomber force and must have had its effect upon the decline of the U-Boat menace. Immobility from oil shortage caused the capture of tens of thousands of German soldiers and the destruction of their vehicles. Lack of oil and communications shattered by air bombardment retarded divisions arriving to reinforce the Normandy front in June. By December, when von Rundstedt's forces attacked in the Battle of the Ardennes, many units had to set out with extremely limited supplies of fuel, hoping desperately to overrun our positions so quickly that captured stocks would support their further advance. Within Germany the oil situation was so desperate that the recovery and repair program for the shattered industry was given the highest priority in the national war effort, above aircraft and submarine production and all other activities."

General Eisenhower refers, it will be noted, to the prejudicial effect which the bombing of oil installations and the consequent necessity for repairs of them had upon the Germans' capacity to produce new weapons and to intensify their efforts at sea and in the air. His testimony was reinforced by the evidence given by Albert Speer, the former Minister for Armaments, before the Nuremberg tribunal on 18th June, 1946. It was the bombing of aviation petrol dumps at the beginning of May, 1944, which, he stated, dashed the Germans' hopes of putting new jet planes, new U-Boats and a new anti-aircraft defence into use.

Still more notable was a reply which Speer gave when he was interrogated after his capture in May, 1945. He was asked whether he believed that strategic bombing alone would have brought about the surrender. He replied: "Yes. The attacks on the synthetic oil industry would have sufficed without the impact of purely military impulse to make German powerless." This reply was quoted by Mr. John Strachey, the Under-Secretary of State for Air, when he introduced the Air Estimates in the House of Commons on 12th March, 1946.

It was not only in the operations in the West that the German shortage of oil had a disastrous effect upon the defence. It made itself felt in the East, also. The United States Strategic Bombing Survey states (*Summary Report*):

> "In February and March of 1945 the Germans massed 1,200 tanks on the Baranov bridgehead, at the Vistula, to check the Russians. They were immobilized for lack of gasoline and overrun."

The Delayed Offensive

Seeing how great was the effect of the intensive campaign against oil targets in 1944-45, one is prompted to ask whether the Allied air effort ought not to have been directed against them all through to a greater extent than it was, or at all events, whether it might not have been inaugurated at an earlier date. To have concentrated the attack on oil objectives, neglecting all others, would probably not have been good policy. The result would almost certainly have been an inten-

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sification of the defence of the oil plants, and the elimination of them would have been a more difficult task than it was. What happened at Merseburg in December, 1944, is instructive. On the 6th of that month a strong force of aircraft of Bomber Command attacked the Leuna oil plant; they found it particularly strongly defended. It had become a priceless asset to the Germans, for all the synthetic plants of the Ruhr were temporarily out of action. To protect Leuna they had massed around it 400 heavy guns, as many as there were in the Berlin perimeter. To save it they had denuded other places of their defences. That would have happened at all the oil plants, and powerful forces of fighters would have been assigned to their defence, if they had been the only targets threatened by Allied bombers. In that event the campaign against oil might well have been halted. As it was, the Germans could not afford to leave the cities unprotected, and the defences available for the oil plants were the less on that account.

It has also to be remembered that it could not be known as a certainty before trial that the attack on oil would be the success that it was. The attack on industry might still have been the more paying proposition. We could only find the weak point in the German armour by probing here and there. The oil offensive was a try-out, a kind of gamble. When Sir Arthur Harris was directed in June, 1944, to take part in the campaign against the synthetic oil plants which the Americans had begun in April, he tells us in his book, *Bomber Offensive* (p. 220), that he was

> "altogether opposed to this further diversion, which, as I saw it, would only prolong the respite which the German industrial cities had gained from the use of the bombers in a tactical role; I did not think that we had any right to give up a method of attack which was indisputably doing the enemy enormous harm for the sake of prosecuting a new scheme, the success of which was far from assured."

He goes on, however, to say, and the admission does him honour:

> "In the event, of course, the offensive against oil was a complete success, and it could not have been so without the co-operation of Bomber Command, but I still do not think that it was reasonable at that time to expect that the campaign would succeed; what the Allied strategists did was to bet on an outsider, and it happened to win the race."

The Timing of the Campaign

There is certainly a good deal to be said for the contention that the Allied air forces, while not giving up the attack on industry altogether, might well have begun the intensive assault on oil targets earlier than they did. Such is the view of the compilers of the report of the United States Strategic Bombing Survey in regard to action by the American air force. They state:

> "As regards the timing of the bomber offensive, it can be said that oil production should have been bombed as soon as it became possible operationally to penetrate deep into Germany. This appears to have taken place in February, 1944, with the use of P-51 (*i.e.*, Mustang fighter) escort. The obliteration of Germany's gasoline production at this time would have clipped the wings of the *Luftwaffe* three months earlier than it actually occurred."

British bombers working (as they usually did) by night would not have needed fighter escort on their raids, and operationally there seems to be no reason why their attack on oil in 1944 could not have been begun much earlier than it was. It is an interesting speculation, indeed, whether the war might not have been shortened if someone who believed as strongly in the offensive against oil as Sir Arthur Harris did in the offensive against the industrial cities had been chief of Bomber Command in 1943-45. What the effect of an earlier inauguration of the intensive attack on oil might have been can be judged from the admission of a German who was well qualified to express an opinion. General Milch stated, when interrogated after his capture in May, 1945, that "if the synthetic oil plants had been attacked six months earlier, Germany would have been defeated six months sooner." The verdict of history may be that something might well have been taken off the quota of 431,000 tons of bombs which the industrial towns were allotted during the course of the war and added to the 98,000 tons which oil targets received.

Oil Targets in Japan

The position in Japan with regard to oil was different from that in Germany in so far as the former country relied for liquid fuel almost altogether on imports of crude oil, which was refined in Japan, and not on synthetic production. Some 90 per cent. of her oil was imported. (H. G. Moulton and L. Marlio, *Control of Germany and Japan*, 1944, p. 67.) The refineries in Japan were primary objectives of the 20th United States Army Air Force. The assault on them was highly effective; their productive capacity was reduced by 83 per cent. as the result of air attack. (*Summary Report, Pacific War.*) Japan's fleet was largely immobilized by lack of fuel, and most of her warships sunk in home ports were

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laid up on that account. Actually, as the Survey points out, her supplies of oil, as well as of aluminium and steel, were destroyed twice over, once by the cutting off of imports and secondly by air attack. By July, 1945, oil refining had declined to less than 15 per cent. of the 1943 output. She was in desperate straits for oil supplies before the surrender. The statement made by American officers, as quoted in *The Times* of 4th September, 1945, that "Japan had only about one tank of oil left," may have been an exaggeration but reflected broadly the real position at the time of the collapse.

THE BATTLE OF TRANSPORTATION

THE battle of transportation, it has been stated in Chapter VI, was one of the three decisive battles of the air war. Like oil, transportation was one of the earliest objectives of Bomber Command. Like oil, again, it faded into the background in 1941, only to come back into the centre of the picture in 1944. In 1940, perhaps the most frequently raided spot in Europe was Hamm, the great rail centre in Westphalia. It ought to have been flattened, so often was it attacked, but the sad truth is that it was not. The assault on this and other railway targets was, in fact, a disappointment. It was not until the autumn of 1944 that the real battle of transportation began. Only then were our and the American air forces in a position to throw into it the weight needed to make the assault effective. The "railway plan for Germany" which was then inaugurated was a contribution of the first magnitude to the defeat of that country.

The "Railway Plan for France"

The plan was modelled on a similar one which had been adopted most successfully in the spring of 1944 with the object of clogging the French and Belgian railway systems before the invasion of the Continent. It had a tactical as well as a strategical purpose. In the three months before the landings in Normandy the Allied bombers had set themselves to dislocate the communications upon which the German forces in France depended for their supplies and reinforcements. This object was achieved with conspicuous success.

How thoroughly the job was done can be judged from a correspondent's description of one of the key points attacked, the junction of Trappes, not far from Versailles.

> "Lancasters and Halifaxes had made three night raids between March and June with terrible effect. Enormous engines had been flung into the air and dropped; others had burst boilers; still more lay in two long lines close to each other, and all wrecked. Climbing to the top of a high signal gantry I looked down on a scene of desolation. About a mile and a half along the often twisted track I threaded my way through a mass of broken trucks and passenger coaches that stood on three or four tracks stretching into the distance. It was amazing to see a great collection of rolling stock looking like half a dozen enormous railway disasters combined into one." (George Fyfe, in *The Daily Telegraph*, 16th September, 1944.)

How the bombing of this and other junctions helped the Allied armies was freely acknowledged by General Eisenhower in his despatch, dated 13th July, 1945, on the operations in Europe in 1944-45. He stated:

> "By D Day the Strategic Air Forces, together with the Tactical Air Forces, had so successfully performed their mission of disrupting enemy communications that there was a chronic shortage of locomotives and cars, repair facilities were inadequate, coal reserves reduced to six days' supply, and 74 bridges and tunnels leading to the battle area were impassable. The communications chaos thus produced had a fatal effect upon the enemy's attempts at reinforcement of the threatened areas after our landing."

Some of the results of the assault were described in a "Joint Statement on Strategic Bombing," prepared by the Air Ministry and the United States Strategic Air Forces in Europe, and issued on 30th April, 1945. It stated, *inter alia*:

> "The German counter-invasion plan was to bring their reserve divisions to the battlefield at the rate of forty-eight trains a day; this was cut by bombing to six trains a day. It is known, also, that some armoured divisions arrived at the battlefield without their armour, and that other troops arrived on bicycles or on foot, in no condition to begin fighting at once."

Transportation or Oil as Objective

Capt. H. C. Butcher tells us in his diary (*Three Years with Eisenhower*, 1946, pp. 433, 436), that the decision to give transportation priority over oil as a target was only reached after a long debate at the end of March, 1944. General Spaatz advocated strongly the bombing of synthetic oil plants. The Germans, he argued, would defend the plants with their air force, and the result would be the destruction of both aircraft and oil. He pointed out that 80 per cent. of all German synthetic oil was produced by only fourteen

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plants, whereas fourteen marshalling yards were only a fraction of the German railway system. Oil could consequently be written off more easily than the railways.

The other view was put forward by Air Chief Marshal Tedder, who considered that the attack on transportation would be more immediately effective as an operation in support of "Overlord," the code name for the invasion of Normandy. The oil plan, he admitted, would ultimately have grave effects on the whole German war effort, but the other would give quicker results. This view prevailed. Capt. Butcher records, under the date of 30th March, 1944:

> "The transportation plan for bombing has won out over the oil plan largely because the oil plant will not seriously affect German military operations for six months, too long for immediate benefit to 'Overlord.' . . . However, it was decided that after "Overlord" is ashore and firmly established, the strategic bombers can then attack the oil industry. The main objective for "Overlord" is to disrupt railways so the Germans will be hindered as much as possible from quickly-moving troops and supplies against our beachhead."

The Railway Plan for Germany

The execution of the railway plan for Germany was necessarily a more formidable undertaking than was that for France. The railways of Western Germany formed a more elaborate network than did the French and were less dependent on the larger marshalling yards and depots. Heavy and widespread attacks were required to cut off the western front from the enemy's main industrial centres. The strategic railways did not by-pass but usually ran through the large cities of Western Germany. These cities consequently became objectives of renewed attack, this time as centres of communication rather than of industry. The effect upon them was not appreciably different in the two instances. The net result was that they were wrecked all over again, though for a different purpose than on the former occasion.

While the industrial towns which were also railway centres had thus a double dose of bombing, others which were railway towns only came under fire for the first time. New objectives began to figure in the official reports: Opladen, for instance, twelve miles north of Cologne, bombed by Halifaxes and Lancasters in the early hours of 28th December, 1944; Troisdorf, a junction on the line between Cologne and Koblenz, bombed by Halifaxes on the night of 29th December; Gravenbroich, twelve miles south-west of Düsseldorf, bombed by Halifaxes on the night of 14th January, 1945; Kornwestheim, five miles north of Stuttgart, bombed by Lancasters and Halifaxes on the night of 28th January; Paderborn, on the main line from Saxony and central Germany to the Ruhr and lower Rhineland, bombed by Lancasters on 27th March and practically destroyed.

The Execution of the Plan

As in the campaign against oil, so in that against transportation the long-range work fell mainly to the United States Army Air Forces, the 8th in Britain and the 15th in Italy; but our own bombers occasionally travelled far afield also. On the night of 17th December, 1944, for instance, they went to Ulm, on the Danube, a junction on the main line running westward to Stuttgart and Karlsruhe, with a branch to the north-west. They bombed the Pilsen marshalling yards and those at Schwandorf, in Saxony, in the early hours of 17th April, 1945, and the yard at Komatau, in Czechoslovakia, on the night of 18th April. The railways at Leipzig, Plauen, Bayreuth and other distant centres were also attacked by our bombers in the closing phase of the hostilities.

In general, however, Bomber Command confined itself to scourging the communications of Western Germany, including the canal as well as the railway system. The Dortmund-Ems canal was repeatedly attacked. It was drained by our bombers for the fourth time on 1st January, 1945, but even then it was patched up and had to be drained again on the night of 3rd March. The Mittelland canal was drained for the fourth time on the night of 21st February, 1945. Viaducts were also dealt with effectively. The first ten-ton bomb was dropped by a force of Lancasters on the viaduct at Bielefeld on 14th March, 1945. The viaduct at Arnsburg was similarly dealt with next day.

Germany's Vulnerable Railways

One of the reasons why the Germans dreaded a strategic bombing war was that they knew their railway network to be a particularly vulnerable one. It happened that the nerve centre of the whole railway system of greater Germany lay within a comparatively small area consisting of little more than the Ruhr and Middle Rhineland districts. In or through one or more of the junctions in this area nearly every main stream of war traffic originated or passed. Freight traffic density in the Ruhr was more than double the average for the whole of Germany. The railways of the Reich were built, in fact, for all forms of war but bombing. If bombing had been foreseen, the nerve centres would have been dispersed, as were the enemy's most recent war industries.

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The Air Ministry News Service, in a Bulletin of 4th March, 1944, from which the immediately preceding information is taken, added that, for supplying the Western front, especially that near Aachen, the Germans had two particular routes which carried the greatest density of traffic in the whole country. They both joined up in the Ruhr district. One ran between Wesel and Bremen, *via* Münster and Osnabrück, and by this 35,000 tons of freight, mostly steel and other heavy goods from the Ruhr, were carried daily in an easterly direction. The other, between Hamm and Hanover, carried a similar weight eastwards every day. There was an alternative route in the shape of the Dortmund-Ems and Mittelland canals, but these, it has already been stated, were periodically put out of action by bombing attacks.

For linking north and south there were trunk lines on each side of the Rhine. On the left bank, 10,700 tons of freight were normally carried southwards and 6,400 northwards every day. On the right bank 34,500 tons went south and 16,000 north daily. All these railways were vulnerable in the extreme.

The Seven Phases of the Campaign

The railway network was wrecked mainly in the second and fifth phases of the seven into which the United States Strategic Bombing Survey divides the campaign against transportation. The seven phases were:

1. August-October, 1944, when the attack was tactical in character and concentrated on the yards through which the bulk of the military traffic passed, such as Saarbrücken, Karlsruhe, Ludwigshafen, Mannheim and Cologne.
2. November-December, when, transportation having been given second strategic priority after oil, a plan to paralyse the railway system of Western Germany was worked out and put into operation.
3. The period of the Rundstedt counter-offensive, when the bomber forces concentrated on paralysing the Cologne-Koblenz-Trier area for tactical purposes.
4. February, 1945, when strategic operations were resumed but concentrated on a smaller area than was envisaged in the November plan.
5. At the end of February, in the operation "Clarion," 8,000-9,000 planes from British and continental bases tried to paralyse Germany's whole railway system.
6. Next, the Ruhr interdiction plan succeeded in isolating the Ruhr from the rest of Germany by the time the Rhine was crossed, on 24th March.
7. Finally, in April, the air forces reverted to a general attack on Central Germany with the object of cutting reinforcements and supplies for both the Eastern and Western fronts and of preventing the enemy from moving into the National Redoubt area.

The Climax of the Campaign

The tempo of the campaign rose and fell and rose again through these phases. It reached its highest point as yet when, on 11th December, 1944, the 8th United States Army Air Force dispatched the largest force ever sent from Britain —1,600 Flying Fortresses and Liberators, escorted by 800 Mustangs and Thunderbolts—to bomb the marshalling yards at Frankfurt, Giessen and Hanau and other targets in Germany. Other great formations operated from Italy on the same day, and altogether more than 3,200 American aircraft from British and Mediterranean bases were in action over Germany. On the following day (12th December) the 8th Air Force sent out 1,250 Flying Fortresses and Liberators, escorted by 900 fighters, to attack rail centres at Hanau, Darmstadt and Aschaffenburg, as well as the Leuna synthetic oil plant. It was in the fifth phase, however, that the campaign reached its climax.

On one day, 22nd February, 1945, some 6,000 Allied aircraft in all, from Britain, France, Belgium and Italy, delivered a mass assault on the whole of Germany's railway network. The attacks ranged from Denmark to Austria and as far east as Lübeck and Leipzig. Of the huge force which was in action on that day the most massive formation was that contributed by the 8th United States Army Air Force in Britain—1,400 Flying Fortresses and Liberators, escorted by 800 Mustangs and Thunderbolts. It bombed thirty marshalling yards spread throughout the Reich. In the days that followed, the American bombers rained heavy blows at railway centres far and wide. On 23rd February they bombed the junctions and yards in the triangle made by Leipzig, Erfurt and Nuremberg. On 25th February the triangle of Munich, Ulm and Aschaffenburg was hammered. On 27th February the Leipzig-Halle district was the catchment area for the bombs. On 28th February the assault was switched to the Ruhr and its neighbourhood. On 1st March, Baden, Würtemburg and Western Bavaria were visited, with Karlsruhe, Stuttgart, Munich and Augsburg as the delimiting points. On 9th March the scene shifted northwards, to Kassel, Osnabrück, Münster, Rheine and Frankfurt. On 10th March, Dortmund, Soest and Paderborn had their turn. Rail centres in Czechoslovakia were also attacked. There was not a focal point of com-

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munication which was not faithfully dealt with by Allied bombers in this or some other phase of the railway plan. It would be wearisome to enumerate all the centres that were attacked. The assault was on the grand scale, wide in its sweep and overwhelming in its massiveness; and all the time, it must be remembered, oil and other targets were being attacked as well.

The attack on transportation was not confined to the enemy's inland communications. His coastal communications did not escape attention. To relieve the pressure on his railways he had been sending supplies by sea from German ports to those in France and Belgium, and those ports and the vessels themselves which hugged the coast naturally became targets for the aircraft of Coastal Command and sometimes of Bomber and Fighter Commands also. The sea areas through which the traffic moved were mined, too, and a large number of ships were sunk or disabled as a result. The attack on the railways remained, however, the main operation in the great campaign directed against transportation.

The Paralysis of Transportation

The result was that the entire railway organization of the Reich was thrown into utter confusion. The success of the plan exceeded expectations. A special correspondent at S.H.A.E.F. headquarters, in Paris, reported on 22nd March, 1945, that "the whole transportation system east of the Rhine is now congealed. The massive striking power of the combined Allied Bomber and Tactical Air Commands has resulted in the Ruhr being cut off from Western Germany to all intents and purposes." (G. Fyfe, in *The Daily Telegraph*, 23rd March, 1945.)

The "Joint Statement on Strategic Bombing," issued on 30th April, 1945, and already quoted, said, *inter alia*:

> "Perhaps the most important of all the bomber operations in the closing stage of the Battle of Germany was the part they played in the isolation of the Ruhr. This part was the draining of the main connection by water between the Ruhr and Central Germany, the destruction of sixteen out of eighteen railway viaducts and bridges, the blocking of twenty out of twenty-five marshalling yards, and the annihilation of the main industrial and railway centres in the Ruhr itself, already largely destroyed in 1943 and 1944."

That the effect of the campaign was even wider and more profound than it was thought to be at the time is made clear by the United States Strategic Bombing Survey. It says in the *Summary Report*:

> "The attack on transportation was the decisive blow that completely disorganized the German economy."

In the longer report it says:

> "The attack on transportation beginning in September, 1944, was the most important single cause of Germany's ultimate economic collapse. . . . By March, coal shipments were scarcely adequate even for the needs of the railroads. The operation of Germany's raw material industries, her manufacturing industries, and her power supply were all dependent on coal. By January their stocks were becoming exhausted and collapse was inevitable."

Whatever may be the assessment of the return made by the offensive directed against industry, there can be no doubt at all that that against transportation paid handsome dividends. On all the evidence it was a decisive factor in the final equation which furnished the answer to the general strategic problem. The direct influence which this great campaign, supplemented by that against oil, had upon the success of the Allied armies has been fully recognized and can hardly, indeed, be overestimated, so important were the results.

The Timing of the Campaign

As in the campaign against oil, so in that against transportation, the question obviously arises whether it ought not to have been inaugurated at an earlier date than it was. It was rather a last-minute campaign so far as it was an intensive series of operations. It took second place to the offensive against industry. Bomber Command dropped 431,000 tons of bombs on industrial towns during the course of the war, and 138,000 on transportation targets. It is a legitimate question whether the latter figure might not have been stepped up at the expense of the former. The important results to be expected from the bombing of transportation had long been appreciated. Even in the first world war the value of a campaign against communications had been recognized. "The transport system," says Sir Frederick Sykes, who was Chief of the Air Staff in 1918, "I always looked upon as a most important and vulnerable target." (*From Many Angles*, 1942, p. 227.) So, too, in the later war, we find General H. H. Arnold, the Chief of the United States Army Air Forces, stating on 5th September, 1943:

> "I have every reason to believe that we can so destroy objectives in Germany that Germany's communications and transportation will be dislocated to such an extent that it will

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be impossible for her to conduct war as she now sees it." (Quoted in *The Times*, 6th September, 1943.)

Yet it was not until a year later that the great attack upon transportation in Germany began. The delay cannot be attributed altogether to the fact that the Allied air forces were too much preoccupied with other and more immediately important targets at that time to be able to spare the necessary strength; there was evidently a marginal strength available, namely, that used for the attacks, for instance, on the aircraft plants. Industry, too, continued to be attacked on a great scale. The truth is that the Allied Governments were not convinced at that stage of the wisdom of an all-out assault on transportation. Not until it was seen what the result was of the execution of the railway plan for France could the case for the adoption of the corresponding plan for Germany be regarded as established. The success of the former plan set all doubts at rest. It was the effect of the destruction of such bottle-necks of the French railway system as the junctions at Vaires (on the Paris-Châlons line), Juvisy (Paris-Orleans), Villeneuve-St. Georges (Paris-Dijon), and Trappes (Paris-Chartres) that proved finally the immense possibilities of a campaign against transportation. Such a campaign was shown to be more profitable than the offensive against industry. Previously there had been competing categories of objectives, and the advantage of attacking one or the other was an open question.

The Need for Reinsurance

It has also to be remembered that there could be no certainty before June, 1944, that the "Fortress of Europe" could be carried by assault. The western invasion might have failed and the Russian armies might have been held up in the East. In that event another plan would have had to be adopted for bringing Germany to her knees. There were, in fact, two kinds of war that had to be envisaged. One was a war in which land power, supported by air power and sea power, would administer the decisive blow. There was another in which air power would have had to beat the enemy down while sea power continued to strangle him. The former kind of war was that which materialized, but the other had to be insured against in case the land attack should not succeed. In the war which did materialize the battles of transportation and of oil were major contributions to the general victory. In the other possible war they would still have been of the first importance, but the attack on industry would have had to take the place of the ground attack and finish off the war.

It would have done so by means of crushing blows at all the centres in Germany which were essential to the continuance of the struggle. The assault would have been on a far greater scale than anything seen previously. It would have battered Germany to death. In no other way could the war have been ended. That was the grim possibility which the Allies had always to consider before the Normandy landing; and their air offensive against industry was the preliminary operation of the alternative strategic plan which might have had to be adopted, if the first plan had not been successful.

As we know, the whole of Germany's economy was on the downgrade from July, 1944, onwards. It would not have fallen so quickly if the invasions had not accelerated the decline, but it would have fallen, nevertheless. The war would have lasted longer, but the end would have been the same. We should have been given a worse time in Southern England by the flying bombs and rockets, but they would not have affected the issue. Germany's collapse would have resulted inevitably from the physical and moral effects of a greatly augmented air offensive and from the grinding force of the blockade, which was also cumulative in its action. The attack on industry was the Allies' second string and they could not let it out of their hands until the end.

Transportation in Japan

In Japan the air assault on transportation had only just started when the surrender came. "The railroad system," says the United States Strategic Bombing Survey (*Summary Report, Pacific War*), "had not yet been subjected to substantial attack and remained in reasonably good condition at the time of the surrender. Little damage was suffered which interfered with main-line operations. Trains were running through Hiroshima forty-eight hours after the dropping of the atomic bomb on that city."

The intensive campaign against the great centres of population and production began in March, 1945, and was in itself sufficient to reduce Japan's war potential to a critical position. The opinion of the authors of the *Summary Report* is, however, that it would have been better policy to attack transportation at an earlier stage. The effect would have been to strangle Japan's economic life.

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The Future Role of The Strategic Bomber Force

BY SQUADRON-LEADER JOHN W. MAY, D.F.C.

INTRODUCTION

NOW that a beginning is being made again to organize the Royal Air Force on a peace-time footing and now that the reports of the United States Strategic Bombing Survey on both the European and Pacific theatres are readily available to British readers, the time seems opportune for those who are interested in the future development of strategic bomber forces to examine the lessons of the past and to set in order their ideas for the future. Those are the aims of this article, which is the result of a certain amount of meditation by a serving Air Force officer having available his own experience and also the considerable body of literature, official and unofficial, published on the subject during and since World War II.

Strategic bombing was little more than an idea in World War I, although England was raided by formations of German bombers which were quite numerous by the standards of those days. As is well known to students of military history we, too, had the nucleus of a strategic bomber force towards the end of that first World War—a force of aircraft operating some distance behind the German lines in a role divorced from any immediate tactical connection with that of the Army.

From these small beginnings arose the might of the R.A.F. Bomber Command and of the 8th, 15th and 20th Air Forces of the U.S.A.A.F. The development of such prodigious forces of strategic bombers as filled the skies of Europe and Asia in 1944 and 1945 was possible only because of the far-sighted and determined policy of certain British and American Air Force officers during the dark days of the disarmament shambles. If the strategic bomber forces of World War III are to be truly the weapons of that war and not those of the war just ended, it behoves us to examine carefully what has been learned in the years 1939-45 and to make intelligent, realistic forecasts of our requirements for the next conflagration.

* * * *

The Implications of Hiroshima and Nagasaki

But there are those who claim that the dropping of the atomic bombs at Hiroshima and Nagasaki, and the results of Tests *Able* and *Baker*, have made large bomber forces obsolete overnight. As this opinion is held by a not inconsiderable number of people, some of them in responsible positions, it seems necessary to satisfy ourselves that there are likely to be strategic bomber forces in a war conducted in the foreseeable future before we go on to examine their nature and their role.

The discovery of a way of exploiting the energy released by nuclear fission has unleashed a spate of irresponsible talk which is surely unprecedented. The Smyth Report is available from His Majesty's Stationery Office and a careful reading of it will reassure those weaker brethren who expect the first notice of any future war to be a deluge of atomic projectiles of all shapes and sizes. From the physics of nuclear fission we learn that there are certain very definite limits to the size of atomic missiles. Basically the atomic bomb depends for its effect on the bringing together at the desired time of two pieces of matter which, though relatively stable when separate, are violently unstable when united, the juncture of the two setting in train the desired chain reaction. The stability or instability depends in the last instance on size. Obviously the constituent halves must be below the size at which the chain reaction starts spontaneously (if they were not the bomb would go off on assembly or earlier); but they must be of such a size that when they *are* brought together the result is NOT below that critical size.

Let A be the minimum mass in which a chain reaction will start spontaneously.

Then the size of the bomb must be between A and $2A-k$ (where k is a small quantity).

As far as can be seen there seems little likelihood of any change in these limits, as they are determined by the fundamental physical nature of the process which produces the "explosion." It must be remembered that an atomic bomb depends on the release of energy (largely in the form of heat) by means of a physical change and not by means of a chemical reaction (as with TNT or any normal high explosive). So we see that talk of atomic shells and bullets is founded in fantasy. The actual critical sizes to which reference has been made have not been made public but the weight of the atomic bombs is known to have been of the same order as that of aircraft bombs of normal pattern used in World War II.

Also from the Smyth Report it seems certain that the making of atomic bombs will always

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remain a task requiring very considerable industrial potential, even assuming that all the requisite scientific knowledge is available. It is not likely, as some doleful speakers have alleged, that any small state of the size of, say, Siam, will be able to manufacture atomic bombs overnight and threaten the rest of the world. Even if there is a considerable length of time before the next war it seems unlikely that any power, however warlike its preparations, will have more than a three-figure stockpile of atomic bombs.

It also seems clear that any power will cast up a careful balance sheet before dropping even a single atomic bomb in a war in which major powers are involved. Retaliation would be certain and the power taking the initiative would need to be fully convinced that the enemy was considerably more vulnerable than itself *i.e.*, much more concentrated in its towns, ports and other critical areas.

All these considerations lead me to conclude that while atomic bombs may well be dropped in the next war, they will not change its whole character nor will they alter the requirement for a highly developed strategic bomber force to carry bombs of the H.E. and incendiary patterns.

The Economics of a Strategic Bomber Force

Britain's declining birth rate during the past fifty years is a matter of concern if we should again be embroiled in another world war during the next twenty-five years. We must bear this in mind if we are to base our planning for the future on any realistic grounds. Add to this the fact that for strategic reasons emigration to the Dominions and Colonies must be encouraged among our young people and it can be seen that it is vitally important that in the next war every man shall be used to the best advantage.

Also Britain is a country which depends on the import of a very considerable number of commodities essential for the prosecution of a war. For this reason, and also because of the shortage of manpower to produce finished goods from the raw materials, it is just as important to husband our material resources as it is to husband our men.

These points are stressed because a force of heavy bombers requires extremely lavish backing, both administrative and technical, in addition to a large number of operational personnel. Therefore we need to be quite clear about the value of a force of strategic bombers before postulating it as a continued requirement.

Britain's strategical position has changed and it is clear that in the future we are far more liable to be involved in large continental wars than in the period in which our classical strategy, based almost entirely on sea power, was evolved. As was demonstrated on a small scale in the early years of World War II a democratic country with a relatively small peace-time army may find that the only way to strike at a continental enemy during the period of build-up of a large war army is by strategic bombing.

In World War II 83 per cent. of the bomb tonnage dropped by the R.A.F. and the U.S.A.A.F. in Europe was dropped after 1st January, 1944, and of the tonnage dropped on Germany itself 72 per cent. was not dropped until after 1st July of that year. It is easy to imagine what would have been the effect on the course of the war if the saturation raids of 1944 and 1945 on Greater Germany had taken place in 1940. Germany, as is now known, was planning on a short war and at that time her industrial facilities were little greater than in 1938. By crippling them then and by disorganizing German transportation as we did in the winter of 1944-45, it seems reasonable to assume, Germany could have been so weakened that she would have surrendered to a relatively small army attack.

This, however, is all composed of the stuff of which dreams are made. But I do suggest that despite the heavy calls on men and materials which such a programme will make, Britain should embark whole-heartedly on the training and equipping of a bomber force which can be expanded to full wartime strength in a maximum of six months from the outbreak of war. The Germans themselves believed towards the end of the last war that their failure to build a true strategic bomber force and the concentration instead of the whole of the German Air Force on fighter defence and on the direct army-support role had cost them dear. We can endorse this opinion when we recall the narrow margin of our victory in the Battle of Britain.

The Effects of Strategic Bombing

The overwhelming testimony to the effectiveness of the bomber offensive in Europe given by those in the best position to judge—the German leaders themselves—does not need to be emphasized again here. And it is at least a subject for argument as to whether Japan did not really surrender to strategic air power, quite apart from the use of the two atomic bombs.

Although a very large part of the effort of R.A.F. Bomber Command was devoted to area attacks on large centres of population, it is extraordinarily difficult to assess the dividends paid by Air Marshal Sir Arthur Harris's policy. The German leaders appear to have been far more worried about attacks on their basic industries such as oil, chemicals and steel than about

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attacks on armament factories or on city areas. It would appear that a most careful critical appraisal of all the factors concerned is necessary before we commit ourselves again to a policy of area bombing as it can very well result in the expenditure of vast quantities of men and materials for rather dubious returns.

The two most successful target systems taken on by Bomber Command in 1944-45 were undoubtedly oil and surface transportation, in the attacks on both of which Air Vice Marshal Cochrane's highly-developed No. 5 Group played an important role. Here again the best testimony is that of the German leaders themselves and we find Speer writing continually to Hitler to emphasize the gravity of the oil situation and the vital need for economies—economies which were to cripple the German Air Force and the Panzer Divisions. A special repair organization, under Edmund Geilenberg, employed as many as 350,000 men on repairs to these all-important plants.

From D-Day to VE Day the successful strategic attacks on the transport system of Greater Germany were among the principle factors contributing to the rout of the German forces. Commanders in the field lost their mobility; reserves and reinforcements could never be got into position in time and the German army was like a boxer fighting with one hand tied behind his back.

The atomic bomb will inevitably exert a strong influence on the planning for the next war and it seems to be generally agreed that the principle defensive counter to it will be dispersal—of industrial potential, of ports and of military formations. Wholesale dispersal of this nature will mean that transport, much of which is bound to remain on the surface, will be of greatly enhanced importance. Here then is going to be a primary target for future strategic bomber forces and we must study intensively all the lessons learned in this field in the last war, many of which, incidentally, are excellently set forth in Air Marshal Sir Robert Saundby's lecture, reprinted in the November, 1945, issue of the *R.U.S.I. Journal*.

Accuracy of Bombing

The accuracy of bombing achieved by both the Americans and ourselves has been the occasion of a good deal of discussion, and while we can safely assume that research will improve the accuracy of future bombing techniques, we should be well advised to glance briefly at the techniques which had been developed by the end of World War II.

Many rude stories and songs have gone the rounds about dropping bombs in pickle barrels from 30,000 feet and among the popular writers there has been of late a definite tendency to decry the results achieved by the heavy bomber crews. The fact remains that in 1944-45 the crews of Bomber Command's No. 5 Group were able to find small targets at night at extreme range and to hit them with great accuracy. Individual targets, such as oil refineries, were completely destroyed in night raids and as will be remembered the Mitteland and Dortmund-Ems canals were cut on several occasions with spectacular success. One of the important facts that emerged in the development of this technique was that there was a definite upper limit to the number of bombers which it was practicable to use and control over a single target. This limit, in 1944-45, was about 200, or even less on very small targets. It seems reasonable to suppose that in future this figure will be even less. I shall refer to this point again later.

The results achieved by No. 5 Group, to which I have just referred, were in the main achieved at medium bombing heights (about eight to fourteen thousand feet) and this links up with a point which must be made about American technique. As is well known the B 29 was designed to fly fast and high; it was, in fact, referred to officially as a stratosphere bomber. And yet, in his Third Report to the American Secretary for War, General Arnold writes that one of the important decisions of the war was when Major-General Curtis Le May (commanding the B 29s in the Pacific) decided to attack Tokyo in force from low level (actually about nine thousand feet). This attack, carried out with incendiaries, devastated Tokyo and caused 187,000 casualties, setting the pattern for the great campaign against Japanese industries which in many people's opinion was the real cause of the Japanese capitulation. This campaign of Major-General Le May's was the finest example of strategic bombing in World War II, the commander having available to him all the lessons learned in Europe. It is highly significant that to achieve this great victory aircraft designed to operate at thirty thousand feet and above were in fact operated at nine thousand feet. We should bear this in mind when there is so much talk of the bombers of the future flying at forty-five thousand feet. If we want accuracy against individual targets we must think carefully before we commit ourselves to aircraft which will be right out of their optimum environment if operated at low levels. This whole question is, of course, intimately bound up with the need for a review of the policy of area bombing to which reference has already been made.

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A Specialist Force

"Not until the war in the air had been won and the landings in the Mediterranean and France successfully accomplished, were the heavy bombers free to exploit the victory in the air and attack in full force the centers of oil production, the centers of transport, and the other sustaining sources of military strength within the heart of Germany. Even then the attack could not be fully concentrated, for the V 1 and the V 2 were serious threats to England, and again air power was called upon to attack this threat by bombing the launching sites in France, Belgium and in Holland," — THE UNITED STATES STRATEGIC BOMBING SURVEY—Overall Report (European War).

That quotation contains within it two interlinked and very important lessons that should be learned from the last war. Firstly, that offensive air power in the shape of heavy bombers should operate under cover of air superiority and not waste its efforts in useless combats *en route*, far from its objective. Secondly, that the diversion of the strategic bombers to tactical targets can result only in a crippling of the overall strategic effort.

The first of these two postulates is admittedly an ideal, but it is the ideal for which we must work and which we should keep in mind during our planning for the future; it *is* only an ideal because air superiority must be won not only in the enemy air by our fighters, but also by the bombers themselves in destroying the factories producing airframes, engines and all the other components that make up an operational aircraft. However, the heavy bomber is basically a bomb with four (or maybe more) engines attached to it—the Lancaster and the Lincoln with twelve thousand and twenty-two thousand pound bombs came within measurable distance of this conception. All development in the future must be in the direction of increasing the ratio of bomb load to total all-up weight, and it is clear that this can be done principally by keeping out of the aircraft all unnecessary auxiliary equipment. Heavy defensive armament must be included in this latter category—the strategic bomber has one task and one only, to deliver bombs to a given target at a given time. During the six months after the outbreak of war that will be required to build up the strategic bomber force to its full operational efficiency; it must be the task of the long-range fighters to win air superiority and, if possible, air supremacy over the enemy's territory by day or by night (as required by the commander of the strategic bombers).

The grand strategy of Bomber Command and 8th Air Force was seriously upset in 1944-45 by the continual diversion of their forces to attacks on purely tactical targets. It is significant that Air Marshal Coningham in his lecture on Tactical Air Forces, printed in the May, 1946, issue of the *R.U.S.I. Journal*, expresses grave doubts as to the value of tactical support given by heavy bombers. However, the point it is desired to make here is that if it is considered by the Army that there is a tactical role for heavy bombers, then there should be squadrons of such aircraft in the future Tactical Air Force.

What we must keep firmly in our minds is that in a force of strategic bombers we have a great potential striking power if it is used in the specialist role for which it has been designed and developed. Aircraft of a strategic bomber force should embody the very latest ideas in research and should be designed to carry bombs to distant targets and drop them accurately where they are required; the crews that fly these aircraft should be highly trained specialists in that work. Obviously then, this force, expensive as it is in men and materials, should not be at everybody's "beck and call" for odd jobs, as Bomber Command appeared to be at times.

Equipment and Training

If, then, the strategic bomber force of the next war is to be an even more highly specialized arm than Bomber Command and the U.S.A.A.F.'s 8th and 20th Air Forces were in World War II, it is certain that a considerable amount of thought must be devoted at once to specifying the equipment and training that are required.

The point has already been stressed that the ideal bomber is little more than a bomb with the necessary motive power to take it to the target. Carrying this idea to its logical conclusion one has the V 1 or V 2 developed to a greater size. But it seems extremely doubtful whether such weapons can achieve in the immediate future the very high degree of accuracy necessary to make their use an economic proposition. Also, as pilotless missiles become larger the complexity and value of the propellent machinery thrown away with each missile becomes larger—a not unimportant consideration for a country with limited industrial resources. The more orthodox bomber aircraft has the merit of returning to its base for further use, and it is worth remembering that every sortie provides valuable experience for the operational personnel so that there should be a progressive increase in accuracy throughout the campaign. What is most important is that the designers of the bombs and the designers of the bomb-carriers (the heavy bombers) should work in the closest co-operation

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so that we may approach as closely as possible to the ideal of a "grand slam" bomb fitted with engines.

If we are to have piloted craft as the basis of our future bomber force that does not mean to say that we must think in terms of the Lincolns and B 29s of today. We want an aircraft to carry either the heavier bombs that must be developed in the next few years or greater numbers of existing sizes of bombs and to carry them further; these aircraft will, of course, be fitted with jet propulsion. Economy of weight is a prime consideration and therefore besides eliminating all unnecessary equipment we must keep the crew as small as possible. There must be intensive research into decreasing the weight of existing equipment and producing new light-weight devices to replace crew members (one random suggestion is an ultra-light radio teleprinter to replace the present wireless operator whose very small amount of transmitting could easily be taken over by one of the other members of the crew).

Training must be imaginative above all else, and must aim at producing a corps of specialists —aircrew, ground staff and headquarters personnel—who can build up a full wartime force from the peace-time nucleus in not more than six months and can then throw it into action. The wartime force, as already indicated, will need to consist of units of about, or slightly less than, 200 aircraft (depending on the number found necessary to deal with one target) and I suggest that we should aim at having three such groups as the maximum number that can be equipped and maintained at full operational pitch without prejudice to other parts of the future war effort. One of these groups should be fully trained and equipped in peace-time; an expansion to three times its peace establishment in a space of six months should be easily accomplished if adequate plans and preparations are made.

The training carried out must consist of much more than the dropping of practice bombs at ranges round the coasts of Britain. Such practice is essential, but the foundation of a strategic bomber force, as was proved conclusively in the last war, is sound navigation. There should be simulated, therefore, large-scale raids by as many aircraft as possible from the peace-time force on targets as distant as, say, Johannesburg, in order to test new navigational aids and to train navigators in their use. Such exercises would have the added advantage of giving valuable experience to the air defence organizations of the Dominions. Even if carrying out such training meant cutting down other flying to keep the Treasury happy, it would, I believe, be well worth while.

So far in this article nothing has been said on the vexed question of night or day bombing. It seems that as ranges increase the strategic bomber force will have to develop techniques that are suitable for day or night equally. In as far as there is still a choice, the development of night techniques would appear to be preferable, as even with the most modern air defence organization there is little doubt that the problems of the enemy are greater by night than by day. Also the psychological effect upon an enemy of the continued descent of bombs from unseen aircraft cannot be ignored.

Our victory in the air in the dark days of World War II was entirely due to the superiority of the training of the R.A.F. over that of the German Air Force. Nothing must be allowed to stand in the way of an emphasis on quality in the future Air Force. War is becoming a matter of mental stamina. In the future organization of the strategic bomber force there must be scientists, planners and fliers of the highest calibre and with the best training that can possibly be given.

Intelligence

As already stressed, it has to be kept continually in mind that a strategic bomber force is a heavy drain on manpower and materials that can be justified only if every bomb is used to the best advantage. This pre-supposes a first-rate intelligence organization being at the commander's disposal, both in peace and war.

The Germans were pleasantly surprised at some of the golden opportunities missed by the Allied bomber forces in World War II. For example the only three plants (two in Germany and one in France) supplying tetra-ethyl-lead to the German Air Force could barely provide the necessary supply. Although that chemical was an essential constituent of aviation fuel in the last war these plants were never bombed despite the fact that by their very nature they were extremely vulnerable to such attack. Again, Speer stated that a loss of 40 per cent. in electric generating capacity in Germany would have been dangerous and that a loss of 60 per cent. would have caused the collapse of the war economy; the destruction of forty-five plants would have achieved the former figure and of 95 the latter. But there was no systematic campaign aginst the electric generating facilities of Germany.*

It is always easy to be wise after the event and doubtless there were very good reasons why these and other vulnerable target systems were not attacked. However, it is clear that any future strategic bomber force must have at its disposal

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a first-class combined military and economic intelligence team who can pick out the real weak spots in the enemy's economy. Then the commander can apply the fundamental principle of concentrating his forces at the weak points in the enemy structure. It should be borne in mind, too, that although in World Wars I and II we fought an enemy whose language and customs were well known to many of our own citizens and with whom in peace-time there was a relatively normal exchange of visitors and of information, this may not be so in a future war. Therefore one of the first peace-time tasks of the intelligence staff of the strategic bomber force must be to examine new methods of gaining information and of keeping it up to date.

Morale

The assessment of morale is one of the most difficult of problems, and the various attempts that have been made to assess civilian morale in both Germany and Japan in World War II demonstrate this only too clearly by the divergence of their results. The problem is, of course, made even more difficult when we try to decide the effect of any one factor, say strategic bombing, on the level of morale. However, the subject is so important that we must make some effort to overcome the difficulties.

In the last analysis the object of all warlike operations is to change the enemy's mind, to influence his will to make war, for this reason psychological studies of past campaigns may provide us with valuable information for our future planning. This is a subject of enormous scope which has not been studied by military authorities as much as it should have been. It is possible here only to touch briefly on one or two points directly related to the main topic.

The general consensus of opinion seems to be that bombing did affect the German will to resist and also helped to weaken the hold of the Nazi Party, especially in view of Goering's avowals that Allied bombers would never fly over the Third Reich. The continued passage of large fleets of Allied bombers over Germany without any effectual check inevitably influenced morale adversely.

It appears that continuous bombing of the same town gave a diminishing return as far as any effect on morale was concerned and this indicates that the policy (evolved for other reasons) of saturation raids, completely destroying the centre of a town in ten or fifteen minutes, was correct from this aspect. This is confirmed from our own experience; we can imagine the effect if the raids on London had been crowded into a quarter of an hour each night instead of being spread over several hours. In saturation raids the fire services are completely overwhelmed and quite powerless; this fact in itself is destructive of morale. A prolonged series of raids on the same area makes people so apathetic to everything except keeping alive that they are willingly led whither those in power may desire. The short, sharp and decisive raid must, from every point of view, be the aim of the commander of the future strategic bomber force.

The German people feared night raids considerably more than those taking place during the hours of daylight; the problems of the civil defence organization are greatly increased at night. As far as possible, then, night bombing should be the aim for the future. Some of the most serious effects on morale in Germany were caused by disruption of transport and electric systems. These, as has already been pointed out, were also targets of outstanding economic importance. In a future campaign careful study will be needed to find targets which combine economic and psychological vulnerability. Such study, and the employment of its results will be essential because now that modern war has reached a state where its continuance so completely disorganizes world economy every possible step must be taken to make a future conflict short and decisive. If this is not done there may be danger of the morale of our own people being adversely affected.

CONCLUSION

The intention of this article has been to indicate the broad lines along which the writer considers that the future development of our strategic bomber force should proceed. This is a subject worthy of careful study; the bomber in its form at the end of the last war was a comparatively new weapon† and much remains to be learned about its employment before we can be confident that it will always be used to the best advantage in the future air force. Certain assumptions have been made, such as that the atomic bomb has not made a large bomber force obsolete, but all these assumptions have been stated. One point that has not been specifically made is that it is assumed that World War II has demonstrated the immense potentialities of air power beyond all shadow of doubt. As a corollary to this it has been implicitly assumed that a strategic bomber force might be considered worth the expenditure of a larger proportion of the funds voted for the Services than in the past, but the importance has been indicated of keeping the share of personnel and industrial potential allotted to the strategic bomber force

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The Liberation of Europe

(OPERATION "OVERLORD"), OPERATIONS OF COASTAL COMMAND, ROYAL AIR FORCE, FROM MAY TO AUGUST, 1944*

The following despatch was submitted to the Secretary of State for Air on November 1st, 1944, by Air Chief Marshal Sir Sholto Douglas, K.C.B., M.C., D.F.C., Air Officer Commanding-in-Chief, Coastal Command, Royal Air Force.

I have the honour to submit a despatch on the preparations for and results of operations by my Command for the period May to the end of August, 1944. By September the successful progress of our Armies during the three months that they had been established on the Continent had denied the enemy the effective use of the Bay of Biscay ports as submarine bases from which to conduct his war against our shipping. This marked the end of an important phase in the U-Boat war.

Planning and Preparation

Preparation by the Enemy and Ourselves

2. At the end of March, 1944, there were signs that the enemy was reducing the number of U-Boats operating in the Atlantic, presumably with the intention of conserving his forces for the forthcoming assault. This was confirmed in April, when the number operating in this area was very small. The lull continued during May, with large concentrations of U-Boats in the Bay of Biscay ports. This policy of the enemy's, while it reduced our opportunities for killing U-Boats, permitted an intensive training programme for the Leigh Light squadrons in the United Kingdom—which I had started at the end of March—to proceed without hindrance. The urgent need for Leigh Light aircraft over the past two years had meant that aircrews turned over to this role had had insufficient time to devote to training, and the standard of homing and Leigh Light manipulation was not as high as it might have been. Ten weeks' intensive training was carried out by the U.K.-based Liberator and Wellington searchlight squadrons, and when D-day came the standard was much improved.

Directive for "Overlord"

3. In April, 1944, I issued to my Groups a directive which set out the tasks of each Group for the "Overlord" operation that was shortly to take place, and outlined the action that the Admiralty anticipated would be taken by the enemy.

Anti-U-Boat

Appreciation of Enemy Intentions

4. On the assumption that the enemy would direct his U-Boat offensive principally against our cross-channel convoys, the Admiralty appreciated that the bulk of his U-Boats would operate from the Bay ports and endeavour to penetrate the South-West Approaches to the Bristol, St. George's and English Channels, and that he would maintain only comparatively small forces in the Atlantic to hamper the passage of our convoys. The main focus of our anti-U-Boat operations was therefore to be in the South-West Approaches, and the effort directed to

* Supplement to *The London Gazette* of 28th October, 1947, published by H.M.S.O.

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within reasonable bounds. Defence against strategic bombing has not been considered as it seems to be a separate and rather special subject.

I have referred always to the Strategic Bomber Force, and not to Bomber Command, to avoid begging an important question which, I believe, should have the benefit of some serious study by the Air Council. That question is whether we should retain Bomber Command as one of several roughly equal commands in the Royal Air Force or whether a Strategic Bomber Force should be set up directly under the Minister of Defence or the Chiefs of Staff, as the 20th Air Force was controlled directly from Washington. There are many arguments in favour of the latter course, but that is another subject.

* It was no fault of the Intelligence Branch charged with target information and assessment that these plants were not attacked.—Ed.

† Would it not be more correct and lead to less misunderstanding if this word was confined to the bombs, etc., launched by bombers and that the latter should be confined to the carrier of the weapons.—Ed.

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protecting Atlantic convoys would be drastically reduced. It was also necessary to provide to some extent against the passage of U-Boats through the Northern Transit Area and also against the possibility of the movement of U-Boats through the North Sea. These areas had, however, to be regarded as of secondary importance when compared with the South-West Approaches, and it was not intended to provide permanently for more than thin cover in the Northern Transit Area. The North Sea area would be covered only if the situation demanded it, and my plans allowed for four anti-U-Boat squadrons to be drawn from those allotted to the South-West Approaches and to be transferred to bases on the East Coast should the necessity arise.

Tasks of Coastal Groups

5. The tasks of my various Groups in the United Kingdom in the anti-U-Boat role were briefly as follows:

19 *Group (Plymouth)*

(i) To provide adequate air cover in the South-West Approaches to protect the flanks of the Allied Assault Convoys.
(ii) To provide cover or close escort to Allied Assault Convoys in the South-West Approaches.
(iii) To hunt and destroy enemy U-Boats attempting to attack Allied Assault Convoys in the South-West Approaches.

16 *Group (Chatham)*

(i) In the event of a threat by U-Boats to the Eastern flank of the Allied Liberation Forces by way of the North Sea, to hunt and destroy enemy U-Boats attempting to enter the English Channel from the east.
(ii) To provide cover or close escort by Fleet Air Arm Squadrons allocated to the Group to Allied Liberation Convoys on passage between The Nore and Beachy Head.

15 *Group (Liverpool)*

(i) To provide cover to threatened Atlantic Shipping.
(ii) To cover the entrances of the North Channel against the passage of enemy U-Boats.
(iii) To provide A/U cover in the Northern Transit Area.

18 *Group (Rosyth)*

(i) To provide A/U cover in the Northern Transit Area.
(ii) To provide aircraft for Fleet Reconnaissance duties.

The Main Threat

6. In the main area of the S.W. Approaches, the first principle adopted was that of "the cork in the bottle," the object being to flood an area of sufficient depth to kill or keep submarines submerged from the Western limits of the St. George's and Bristol Channels and the English Channel up to a point as near as possible to the route of our cross-channel convoys. The patrols were so calculated as to provide a cover of thirty minutes' density in the area. By this plan I expected a high percentage of kills if the U-Boats came through on the surface, or, alternatively, it would force upon them maximum caution tactics throughout their passage. In the latter event there would be a zone to the east of the flooded area in which U-Boats would be forced to surface for prolonged periods to recharge their batteries, and in which they could be attacked and hunted by air and surface forces with good prospects of success. Moreover, individual patrol areas were so designed as to be readily removable from one part of the main area to another, so that one portion could be immediately strengthened at the expense of another in the light of the situation as it developed. Further, the "cork" could be pushed home or withdrawn at will. In this way the plan preserved flexibility without detriment to the principle upon which it was based.

The Need for Fighter Cover

7. The extent to which the "cork" could be inserted was considered dependent upon the degree of fighter cover that could be provided by A.E.A.F., since the Southern boundaries of our patrols ran close in to the coast of France along which the enemy was expected to move his U-Boats under cover of his fighters and shore defences. Once the assault was launched it was expected that the enemy fighters would be heavily engaged in the area of the main battle and that no substantial numbers of S.E. fighters would be able to be spared for the protection of U-Boats. The commitment for providing fighter cover was not, therefore, likely to be a prolonged or heavy one, but it was reasonable to expect from the enemy some early reactions to the preparations in progress and also to any exercises which took place before D Day. One such exercise, known as "Fabius," was considered sufficient to make it possible that the enemy might believe the assault was starting. Should this happen, I considered that it might be necessary prematurely to implement the plans of my Command in full, and in this case the requirement for S.E. fighter cover would become much more serious. I considered, however, that at this stage our fighters would not be heavily committed else-

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where, and Air Commander-in-Chief, A.E.A.F., confirmed that full-scale fighter support could be provided any time up to D Day. Provision for the protection of A/U aircraft against enemy long-range fighters (Ju. 88's) was to be met by allotting Mosquito and Beaufighter aircraft of my own Command for this task.

Convoy Cover

8. In addition to flooding the selected area, plans were made for the protection of our cross-channel convoys sailing along the South coast of England. I allotted this task principally to the Fleet Air Arm Squadrons (eight of which were placed under my operational control for "Overlord"), backed by such 19 Group aircraft as I could spare from their main task.

Operation of Surface Hunting Groups

9. Surface hunting groups were to be operated under the control of the Naval Commanders-in-Chief, Plymouth and Portsmouth. Co-operation between these Groups and aircraft was arranged between A.O.C., 19 Group, and C.-in-C., Plymouth, who co-ordinated his own requirements and those of C.-in-C., Portsmouth.

ANTI-SHIP OPERATIONS

Tasks of 16 *and* 19 *Groups*

10. It was expected that the enemy would launch an offensive with destroyers and light surface craft against our convoys sailing to and from their assembly ports and on passage across the Channel. Air operations to meet this threat were to be conducted by 16 and 19 Groups, whose tasks were as follows:

19 *Group*

(i) To hunt and destroy E-Boats and destroyers in the S.W. Approaches and Western Channel.
(ii) To provide anti-E-Boat and destroyer reconnaissance in conjunction with Naval Surface Forces operating in the area in (i).

16 *Group*

(i) To hunt and destroy E-Boats and destroyers in the Southern North Sea.
(ii) To provide anti-E-Boat and destroyer reconnaissance in conjunction with Naval Surface Forces operating in the Southern North Sea.

Form of Operations

11. It was correctly appreciated that anti-ship operations would take place mostly at night and at dawn and dusk, and these were to take the following forms:

At night

(i) Operation of Albacore and Swordfish under G.C.I. control of 10 and 11 Groups.
(ii) Reconnaissance by Wellington flare-dropping A.S.V. aircraft operating under 16 and 19 Groups, and the subsequent direction of Naval Surface Craft and/or Coastal Command Beaufighters to the target.

At dusk and dawn

Beaufighter sweeps with the object of destroying enemy light surface craft when leaving harbour at dusk or returning from patrol at dawn.

12. As in the case of anti-U-Boat measures, I was prepared to implement these plans as a result of enemy reaction to exercises such as "Fabius," or to any other event which might have led him to believe that the assault was imminent.

Main Battle Zone

13. In agreement with the Admiralty and the Air Commander-in-Chief, A.E.A.F., I demarcated an area between the lines Portland to Jersey on the West and North Foreland to Calais on the East, as the main battle zone. Coastal Command aircraft were to operate primarily on the flanks of this area and only to a limited extent within it. This was an important point. I expected such a concentration of shipping of all sorts in this zone that even by day I considered it would be difficult to distinguish friend from foe, and at night almost impossible. As it turned out, however, it became possible, by special briefing at Area Combined Headquarters, for my anti-shipping aircraft to operate within the Battle Zone outside the central area containing the cross-channel shipping lanes.

Order of Battle

14. The Order of Battle, as it stood on 6th June, 1944, shows that, in order to make the flooded area in the South-West Approaches effective, I deployed no less than 21 of my A/U squadrons together with four Fleet Air Arm squadrons in this area. My anti-shipping striking force consisted of seven Beaufighter squadrons, of which I allotted initially five to the east of the main Battle Zone where the threat of E-Boats was considered greater, and two to the west.

CONDUCT AND RESULTS OF OPERATIONS

U-Boat Operations in the North

15. Intensive operations for Coastal Command began in mid-May, although only the Anti-U-Boat squadrons in the North were in-

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volved. At this time the enemy decided hurriedly to reinforce his U-Boat flotillas in the Bay of Biscay by moving a number of his Norwegian-based boats into the Atlantic and thence southwards to the Channel and French West Coast ports. The U-Boats were presumably in too much of a hurry to proceed submerged, and their commanding officers were apparently confident in the efficiency of their anti-aircraft defences, for they remained on the surface and shot it out with the aircraft to their own detriment. Every opportunity was taken to bring to bear on the enemy the fullest weight of attack without reducing the forces preparing for the vital struggle which was shortly to take place in the South-West Approaches, and I therefore moved detachments of squadrons from Iceland and Northern Ireland to airfields and flying boat bases in Northern Scotland and the Shetlands, to supplement the aircraft at the disposal of the A.O.C. 18 Group. All through June and July these Northern operations went on, and towards the end of July they had extended into Arctic waters, where the enemy seemed to be trying to work round into the Atlantic out of aircraft range. This meant that operations were being conducted at no less than 850 miles from the aircrafts' bases. At the end of June, however, I had moved the whole of the VLR* Liberator squadron from Iceland to Tain, and this squadron bore the brunt of the operations conducted in these very far Northern regions.

16. During June perhaps three or four boats in all got through to the Bay of Biscay. The rest were either destroyed or damaged and forced to put back to Norway. In those Northern latitudes at that time of year there was no darkness, and, at the beginning of the battle at any rate, few of the Northern U-Boats had been fitted with "schnorkel." These two factors were largely responsible for the opportunities for so many attacks.

17. During the period mid-May to the end of July, we sighted seventy-five U-Boats in Northern waters and attacked fifty-one. Of these sixteen were sunk or probably sunk and twelve damaged. These successes were not achieved without cost. 162 Canadian Squadron sank four U-Boats and lost three Catalinas in June alone. Two Victoria Crosses were awarded to officers taking part in these operations, one posthumously to the captain of a Catalina of the aforementioned 162 (R.C.A.F.) Squadron, and a second to the captain of a Catalina of 210 Squadron.

* Very long range.

U-Boat Operations in the South

18. Despite the importance of these far-away operations, it was inevitable that the main attention should be concentrated on the beaches of Normandy and the English Channel. The preparations for the assault and the large-scale exercises during the last few days of May and the beginning of June did not produce any reactions from the enemy, and on 6th June the majority of the enemy's operational U-Boats were still assembled in the Biscay ports. They were not offensively deployed on that date, so there can be no doubt that the enemy had been unable to discover the date of our landing. On D Day, however, he reacted swiftly. It soon became clear that the U-Boats were making for the assault area with the utmost speed—that is, on the surface whenever possible. The air patrols which had been planned to counter this move were already being flown and successes soon materialized. Off the Brest Peninsula and in the mouth of the Channel, thirty-six U-Boats were sighted by Coastal Command in the first four days of the assault and twenty-three were attacked. Six were destroyed and four seriously damaged. Sixteen of the attacks were at night. Two of the U-Boats destroyed were sunk on one sortie within twenty minutes by a Liberator of No. 224 Squadron, piloted by Flying Officer Moore. In almost every case the enemy fought back desperately with his anti-aircraft armament, for in those four days the U-Boats were in too much of a hurry to be able to proceed submerged. They inflicted a high proportion of casualties on our attacking aircraft, but very few got through. Prisoners of war from the U-Boats have told us that the penetration of the Channel was a nightmare.

19. After D plus 4 the enemy was forced to change his tactics. During their sojourn in the Bay ports almost all of the U-Boats had been fitted with the exhaustible air intake ("Schnorkel"), and from the fourth day of the assault until the end of June sightings mainly consisted of periscopes and "Schnorkels" of U-Boats trying to get through by remaining submerged continuously and by relying on "Schnorkels" to ventilate the boat and charge batteries. The "Schnorkel" is a most difficult target for airborne radar, and it cannot be denied that the enemy's recourse to this cautious method of approach reduced his losses. At the same time, however, the effect of remaining submerged had an adverse effect on the morale of the U-Boat crews and their achievements were notable by their absence. Between D plus 4 and the end of June forty-seven sightings of U-Boats were made

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by Coastal Command in Southern waters and twenty-four were attacked. During this period at least one more U-Boat was sunk by aircraft and two kills were shared with ships of the Royal Navy, who were taking an ever-increasing part in the policing of the Channel and its approaches. In addition, aircraft damaged another four U-Boats and shared with the Navy in damaging a fifth.

20. In July the picture was the same. The enemy was still trying to get in amongst our shipping by making the fullest use of his "Schnorkel" device. In all, twenty-two sightings were made and fifteen U-Boats attacked during this month, of which two were sunk and another damaged.

21. By the end of July there was no doubt that the enemy's threat had been beaten. Only a small number of U-Boats had got through to our shipping lanes, and, in the three months from D Day to the end of August, of the thousands of merchant ships taking part in the Channel operations, only nine were sunk by U-Boat action.

22. Finally, the steady progress of our armies made it obvious to the enemy that he would soon lose the use of the Bay ports. He therefore began to evacuate them during August and to send U-Boats northward to his Norwegian bases. During the month some ferocious actions were fought in the Bay of Biscay almost within sight of land with U-Boats trying to escape, and six were accounted for by Coastal Command aircraft, three of these being shared with the Navy. By early September, the Biscay U-Boat force had withdrawn and was making its passage, underwater nearly all the time, to the Norwegian ports.

23. In the whole battle in the North and the South from mid-May to the end of August, Coastal Command sank twenty-seven U-Boats, damaged another so badly that when it reached its base it was paid off, shared in five more sunk, and damaged another twenty-nine, including two shared with the Royal Navy.

24. In these operations, where skill counted as much as courage, and where both were indispensable, we lost thirty-eight anti-U-Boat aircraft by enemy action and another twenty-two through the hazards of maintaining our patrols in fair weather and in foul. A high proportion of these aircraft were four-engined heavies with large crews.

Anti-Shipping Operations

25. While the U-Boats were being defeated in the south-west and the north-east, Coastal Command was also in action against enemy surface forces. Soon after the assault began, the enemy tried to reinforce his surface craft in the assault areas by bringing up three destroyers from the Gironde. These vessels were attacked by our aircraft while still south of Brest on 6th June, but the damage inflicted did not prevent the enemy from making port. Two days later the ships tried to round the Brest Peninsula, but were brought to action by the Royal Navy. One Seetier class destroyer was driven ashore, the *Tjerk Hiddes* was sunk, and the second Seetier was forced back to Brest. The beached destroyer was later attacked by Beaufighters with rockets and bombs, and became a total loss. After this the enemy made no further attempts to reinforce his surface craft from the west, and the only serviceable Seetier and Elbing destroyers were withdrawn to the Gironde.

26. In the early stages, as was expected, the enemy operated his light forces on quite a considerable scale against our assault forces in the assault arm. E-Boats were the main weapons. Some thirty of these vessels were based between Boulogne and Cherbourg, but the number was later reduced by air attack, by surface action, and by the outstandingly successful attacks by Bomber Command against Le Havre and Boulogne.

27. The operations of Coastal Command against these light forces consisted mainly of continuous anti-shipping patrols in the Channel. Albacores, Avengers, Swordfish, Beaufighters and Wellingtons made a great many attacks, mostly at night, against E-Boats, R-Boats, "M" class minesweepers and trawlers. Wellingtons did a great deal of reconnaissance work, dropping flares and directing naval forces to their targets. Results were naturally extremely difficult to assess, but we know from prisoners-of-war that hardly an E-Boat put to sea without being spotted and attacked from the air. In the darkness and in the face of flak from other vessels it is almost impossible to investigate the result of a bombing attack on an E-Boat flotilla, but there is no doubt that the menace of the enemy's light forces was held in check by the operations of the Royal Navy and Coastal Command.

28. The enemy made no use of his major units in the Baltic. Moreover, with the exception of one or two flotillas of E-Boats, he never attempted to reinforce the Channel from the East, in spite of the fact that he had a number of heavy destroyers and about twenty torpedo boats available in the Baltic. It is probable that he realized our combined sea and air defences made the Southern North Sea and the English Channel a very unpleasant area for operations by the German Navy. In any case, it is certain that, despite the few positive results of our night attacks, the enemy was so harassed by them that

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he was unable seriously to interfere with our "Overlord" shipping.

29. This success meant that, from the end of June, my anti-shipping aircraft were able to devote more of their time to the second of their two tasks—the interruption of German coastal shipping. In June, I directed the greater part of my effort to the naval targets in the Channel, and only a few attacks were made on convoys. These, however, included some very successful engagements, the most important of which occurred on 15th June north of the Dutch island of Schiermonnikoog, when Beaufighters sank a merchantman of 8,000 tons, a naval auxiliary of 4,000 tons and a minesweeper, besides damaging four more of the escort vessels.

30. In July I kept up the Channel protection, but diverted all but one of the Beaufighter squadrons to convoy strikes off the coasts of Southern Norway and the Low Countries. There is no doubt that these strikes proved most harassing to the enemy, and he was obliged to divert to this purely defensive task numbers of minesweepers and naval escort craft which he urgently required elsewhere.

31. The beginning of August saw a new phase open in the shipping war. As our tanks swept through North-Western France, enemy coastal craft broke for the comparative safety of the North Sea ports; one night alone saw seventy of them attacked from the air. Moreover, the enemy in the Brest Peninsula was cut off by land. He was, therefore, obliged to squeeze yet more work from his seaborne supply services. Every available ship in Western France from Brest to Bordeaux was pressed into service to keep the beleaguered garrisons supplied. Coastal Command made the best of this opportunity. Mosquitoes based in Cornwall, Halifaxes, previously operating in an anti-U-Boat role, and a wing of Beaufighters, which I transferred from the East Coast convoy routes, operated all along the Biscay coast. Merchant ships, sperrbrechers, minesweepers and coasters of all kinds were sunk, and a fitting climax was reached on 24th August when the last of the larger German warships in this area, a Seetier and an Elbing class destroyer, were sunk in the Gironde by the rockets of the Beaufighter wing.

32. At the beginning of September, the area of anti-shipping activity had moved eastward in the wake of the Allied armies. There were no more attacks in the Bay of Biscay or in the Channel. As the enemy-occupied ports fell into our hands, the night patrols of the Beaufighters, Avengers and Wellingtons moved eastwards along the coast. This happened so quickly that there were no attacks off the Belgian Coast after 7th September, and our attention was turned completely to the intensification of the offensive against the enemy's shipping operating off the Dutch and Norwegian coasts.

33. Thus concluded three months of intensive operations in which the German naval units and merchant shipping in Western Europe had been hammered unmercifully.

34. I wish to end this despatch by paying tribute to all personnel in Coastal Command who by their tireless endeavour and concerted efforts helped to bring about the victory over the enemy sea opposition to the liberation of Europe. In addition to the operations of my anti-U-Boat and anti-shipping aircraft, whose activities have been recounted, the photographic reconnaissance squadrons, the meteorological squadrons and the air/sea rescue air and surface craft all carried out their arduous tasks with skill and resolution.

35. I would like to mention particularly the Fleet Air Arm squadrons which were incorporated in my Command for operation "Overlord." They performed their varied duties with outstanding keenness and precision.

36. A tribute must also be paid to the Liberator squadrons of the U.S. Navy, under Commodore Hamilton, U.S.N., which, working under the operational control of 19 Group, did invaluable work, particularly during the "cork in the bottle" operations.

37. Two Norwegian squadrons, a Czech and a Polish squadron were also distinguished for their gallantry and enthusiasm in the combined team.

38. Finally, it will not be forgotten that the successes of our operations could not have come about but for the skill in planning and organization of the Command and Group staffs, who, with the invaluable and enthusiastic co-operation of the staffs of the Naval Commands, worked long and hard to perfect our preparations; and but for the ceaseless energies of the ground personnel at Stations who provided our aircrews with the means to reap their victories.

SHOLTO DOUGLAS.
Air Chief Marshal,
Air Officer Commanding-in-Chief,
Coastal Command, Royal Air Force.

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German Air Force Operations Against Great Britain

TACTICS AND LESSONS LEARNT, 1940-1941

(Translation of a captured German document—the script of a lecture given by Hauptman Otto Bechtle at Berlin-Gatow on 2nd February, 1944)

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I.

AFTER the Western campaign had been successfully concluded the aim of the German High Command was a speedy decision in the war against Britain. This it hoped to achieve by an invasion of Britain which was to be preceded by German mastery of the air over the British Isles. Whereas, up to the conclusion of the Western campaign, the air war against Great Britain was restricted to very weak forces combating enemy merchant shipping and the enemy navy with bombs, torpedoes and mines along the East coast, under the new circumstances which arose, the total force of the G.A.F. could be employed on a strategic offensive against Britain since the occupation of all areas opposite Britain with their airfields and their installations provided every facility for an enveloping strategic concentration. In spite of such a favourable position, the achievement of air mastery by the G.A.F. presented a formidable task, even though the latter was superior in numbers and frequently also in quality of material.

Previously every opponent had been quickly and thoroughly beaten in so-called "blitz" campaigns. The opening of an offensive by the G.A.F. coincided with the march into, or occupation of, the territory of the enemy State as, e.g., in the case of Norway. In all previous campaigns the G.A.F. had been employed primarily in support of the Army or Navy. For the first time in military history an air force was going to conduct, independent of operations by other services, an offensive which aimed at decisively smashing the enemy air force.

With its brilliant achievements during the earlier part of the war, the G.A.F. had now to attempt to answer the questions of whether it is at all possible to destroy a modern air force solely through operational air warfare—as maintained by the Italian General Douhet—and what is more, to undermine the general fighting power of the enemy by massed air attacks until he is ready to sue for peace.

Of all the enemy air forces operating in 1940, the British Air Force was the most formidable in battle. Encounters of German units with British Spitfire and Hurricane formations during the Western campaign, and above all, along the Channel at the time of the British retreat to Dunkirk, had been the hardest so far.

In supporting the B.E.F. and also their French ally in France, the British had brought only parts of their Royal Air Force into operation.

No attacks worth mentioning had been undertaken by the enemy against Reich territory up to the summer of 1940. But wherever the enemy went on an offensive sweep, as, for instance, in the attack on the cruisers at Wilhelmshaven on 4th September and the thrust into the Heligoland Bight on 19th December, 1939, the attacker distinguished himself by his tenacious courage in the face of grave losses.

It was to be expected that, having learnt the lessons of the campaigns to date which had been so powerfully influenced by the G.A.F., Britain would mobilize all her forces to meet the opening air war against her islands. Until 1940 the emphasis in British aircraft industry lay on the expansion of a *defensive air weapon* which was at about the same technical level as that of the Germans.

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Apart from this, the insular position of Britain makes it more difficult to attack. To reach targets, long distances had to be flown over sea, and the majority of aircrews lacked experience in this type of flying. Pilots of single-engined aircraft, in particular, had to overcome many misgivings when flying over the sea.

II.

Until the opening of the German air offensive, enemy shipping in the Channel was attacked by limited forces of the Kanalkampffuhrer (Channel Command) and by Fliegerkorps VIII, and off the east coast of England by aircraft of Luftflotte 5.

In addition, single aircraft, in the course of a sustained armed reconnaissance, attacked airfields, harbour installations and armament works in Southern England and the Midlands, mostly by night, and in daytime only with the aid of suitable cloud cover. No important new information on the strength of the British defence could be gained during that period.

Masked by these operations which were not intended to bring about a decision of themselves, the strategic deployment of the G.A.F. was completed in July, 1940. Since the Norwegian campaign, Luftflotte 5 (Generaloberst Stumpf) had been deployed in Norway and Denmark, Luftflotte 2 (Generalfeldmarschall Kesselring) in Holland, Belgium and Northern France, and to the south in France was Luftflotte 3 (Generalfeldmarschall Sperrle).

The invasion was scheduled to take place *four* weeks after the start of planned air attacks against the mainland of Britain, which were to be inaugurated on "Adler-Tag" (Eagle-Day). Preparation for the crossing had to be completed by 20th September, 1940. It was planned to cross with the 6th and 9th Armies to various points on the south and south-east coast of Britain, the centre of the attack lying between Dover and the Isle of Wight. The code name for the invasion was "Seelow" (Sea-lion).

Luftflotten 2 and 3 were to secure air superiority over Southern England by operating against:

(*a*) Enemy aircraft, especially fighters in the air and on the ground.
(*b*) Bases and supply installations, especially those of night bomber units.
(*c*) R.A.F. ground units in the London area.

Lutflotte 5 was to pin down enemy defence forces by attacks on airfields in the Newcastle area.

The Command hoped that it would not require more than four days to smash the enemy fighter defences in Southern England. Once this goal was reached, the offensive was to be extended northwards, sector by sector, across the line, King's Lynn—Leicester, until all England was covered by day attacks.

The code word "Adler-Tag" (Eagle-Day) was announced as applying to 13*th August*. During the two previous days *air battles* had developed over the Channel and off the English south coast in connection with bomber and fighter-bomber attacks on the harbour installations of *Portland* and *Portsmouth* and their neighbouring airfields, and these surpassed all previous air combats in the war against Britain, both in scope and in intensity. The decisive battle for air mastery had begun. The "Adler-Tag" did not bring the success hoped for. Because of the unfavourable weather, only a proportion of the attacks planned could be carried out. For the same reason the necessary fighter escort for the bomber units proved very inadequate. Losses for this day were very high. Not until 15*th August* was it possible to bring all forces into operation. The targets for attack by Luftflotten 2 and 5 were again the airfields in Southern England and in the region of London. For the first time Luftflotte 5 attacked the combat area as ordered. Of the 801 bombers and dive-bombers and 1,149 single and twin-engined fighter aircraft of Luftflotten 2 and 3 employed, 73 were lost. The total losses by the enemy were given as at least 143 aircraft.

At the beginning of the daylight attacks the principle of giving bomber formations the *minimum necessary fighter escort only* so as to leave the majority of the fighters free to pursue their real task of destroying the enemy in open combat, was generally accepted. In the very first days of the air war, however, it became evident that the numerous dogged British fighter pilots, who were supplemented by formations of

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volunteers from nations conquered by Germany, made operations by bomber and Stuka units so difficult that it was necessary to have as escort two and even three times the strength of the formation which was to be escorted. The *attack and escort* tactics of each German fighter Geschwader was specified by its Kommodore. There was no standard tactical procedure. The *tactical* unit of the *bomber and Stuka Geschwader* was the *Gruppe*, which was employed on the same principles as during the Western campaign.

In spite of strong German fighter escorts, the British fighter defence caused the Stuka formations unusually heavy losses, so that further use by day of the Ju. 87 against targets on the British mainland had to be abandoned after a few attacks. The performance of the Me. 110 also failed to satisfy expectations.

In comparison with other theatres of war, reconnaissance proved very difficult. Army reconnaissance aircraft formations hardly ever reached the British coast.

After the first week of this decisive battle the German official war communiqué reported for the period 12th-19th August, 624 British aircraft destroyed, 174 German aircraft missing.

Destruction effected on enemy airfields subjected to repeated attacks was considerable by current standards. Yet, during the following weeks, mastery in the air over Southern England could not be achieved.

On 20th August the battle order of the C.-in-C., G.A.F., was as follows: "Continue the fight against the British Air Force until further notice with the aim of *weakening British fighter strength.* The enemy is to be *forced* by *ceaseless* attacks to *bring his fighter formations into operation.* In addition, aircraft factories . . . and R.A.F. ground units are to be attacked by single aircraft by day and night when the weather does not permit larger formations to operate."

The battle against the British Air Force was continued on the lines of this directive without a decision being obtained. Recognizing this fact, the German High Command decided in September to switch the *main weight* of the air offensive to *London*, the heart of the enemy power. Incomparably greater success than hitherto could be anticipated from this policy. For while the main objective of *wearing down the British fighter forces* was not abandoned, *economic war from the air could be embarked upon with full fury, and the morale of the civilian population* subjected at the same time to a heavy strain.

The enemy himself provided the necessary justification in international law for this phase of the war.

During the month of August nightly penetrations by the British Air Force into Reich territory had increased. For the first time since the beginning of the war, Berlin was attacked on 26th August. In view of the systematic attacks by Britain on non-military targets in the hinterland during the Western campaign, the Fuhrer announced on 4th September that he intended the G.A.F. to carry out counter-measures.*

Three days after this speech, on 7th September, the air war began on London, which was the target for the following weeks. For this the bomber units of Luftflotte 5 had been moved to the zone of Luftflotte 2. (Luftflotte 5 did not carry out any further bomber operations against Britain during the war.) The C.-in-C., G.A.F., had personally taken over command, as was announced in the war communiqué of 8th September.

The few daylight attacks by strong bomber formations (200-300 bombers of all types were over the target every time) achieved good results against dock and supply installations along the Thames. Major conflagrations caused extensive devastation. These attacks were continued until 27th September. Losses suffered by formations led thereafter to a reduction of the forces engaged on any single daylight attack to one Ju. 88 Gruppe, and from the beginning of October to the use of fighter-bomber formations only (Me. 109's, each carrying one Sc. 250 (250 kg.) bomb). The individual bomber Gruppe, as well as the fighter-bomber formations with a strength of up to 120 aircraft, was escorted on its outward and return flights by two to three fighter Geschwader.

* The Fuhrer stated: "You will understand that we are now giving our reply night after night, and that in increasing measure. . . . If they (the British) declare that they will attack our cities heavily, then we will wipe out their cities."

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When the weather situation did not permit attacks by regular formations in the prescribed form, use was made of cloud-cover for nuisance raids by single aircraft. The month of October saw the continuation of the war of attrition against London and the final shifting of the main weight of attack from daylight to *night raids*. In September, these had been carried on simultaneously with daylight attacks.

From the middle of November the massed night attacks were extended to the industrial cities and ports of the midlands. The central feature of the prosecution of the war remained the attack on London, however, attacks by day being continued as already described. The tactics of air war by night developed during the ensuing winter months. Only those details of tactics which differ from those now applied will be mentioned here.

Concentration of attack in one place and at one time was not necessary because of the weak defences. The individual units proceeded to the targets along separate courses. To increase the strain on the morale of the population the duration of the attack was prolonged as much as possible. Only the weather rendered it necessary to concentrate the attack. On the other hand, attacking those parts of the target area where the most important economic and industrial targets were sited was already being attempted. For this purpose specific targets were allocated to units in each attack. To facilitate locating of targets and the individual objectives within the target areas themselves, the major attacks were carried out by moonlight. London, offering a large target area, was attacked chiefly during moonless nights.

The dropping of numerous incendiary bombs at the start of the attack had proved its value as a method of target marking. A Gruppe of He. 111 of Kampfgeschwader 100, the so-called "Fire-Raiser" Gruppe (Anzündergruppe) had taken over this special task. This Gruppe made the fullest use of specially narrow beams (x + y beams), which at that time could not be jammed, to help locate the target. Bombs were dropped with the aid of the Goerzvisier 219 or the Lofte bomb-sight in high altitude attacks of 2,000-6,000 metres. The majority of the H.Es. were of 250 to 50 kg. calibre. In addition, very heavy bombs up to a calibre of 2,500 kg. and aircraft mines were used sporadically. The ratio of H.Es. to incendiaries was usually 1 : 1.

As compared with today, the *enemy* defence was *poor*. Single and twin-engined night fighters appeared only sporadically over the mainland and the Channel, but during the winter of 1940-41 numerous long-range night fighters interfered quite effectively in some cases with take-offs and landings. The night fighter defence became more effective from the middle of March, 1941, only. From that time the importance of the anti-aircraft defence was less than that of the night fighters.

From time to time the enemy succeeded in diverting crews from their prescribed targets by cleverly designed *dummy installations*. As an example of a major attack diverted by decoy artifices, mention must be made of the attack on Liverpool on the night of 29th-30th November. Major conflagrations had been faked by pouring burning oil on the Dee estuary west of Birkenhead, and the majority of the crews had taken these for fires in Liverpool.

Apart from these concentrated attacks, *nuisance raids on aircraft industry* and on the *ground establishments*, etc., of *British night fighter units* were accorded increased importance. A few selected and experienced crews carried these out during the night and in poor weather conditions, taking advantage of the element of surprise.

The unfavourable weather associated with this season restricted the activity of fighter units, but the air superiority of the G.A.F. over the Channel and almost as far as the English coast was maintained.

The month of *November* saw twenty-three major G.A.F. attacks on vital British centres. In each attack 100-600 tons of bombs were dropped on these targets. During the period 1st-15th November, 1940, 1,800 bombers dropped 1,900 tons of H.Es. and 17,500 incendiary bombs on London alone. Of the towns attacked, Coventry, a centre of the British aircraft industry, must be mentioned. During the night of 14th-15th November, 454 aircraft raided this town, dropping 600 tons of H.E. and incendiary bombs. Coventry has become a by-word wherever operational air-war is discussed as a result of the extensive damage caused by this raid.

The enemy's hopes of a slackening in the attacks under autumn and winter weather

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conditions were not fulfilled. When at all possible, sorties were carried out, the peculiarities of the various aircraft types being taken into account. If, for instance, Ju. 88 and He. III Gruppen could not operate because they needed a longer runway for take-off and had a higher landing speed, Do. 17's took off in Gruppen on their own. As a result of these tactics, *losses due to bad weather conditions* (such as faulty landing, icing-up, baling out, when badly off course) outnumbered those due to enemy action.

However, this tempo could not be maintained during the following three months. Apart from the numerous QBI weather reports (QBI = bad weather and visibility), the condition of many airfields prevented flying (taxying areas waterlogged). At that time only a few airfields in the West had runways, and concrete taxying lanes.

Not until March, 1941, did it become possible to resume the previous battle tactics with heavy new offensive blows. The Balkan campaign and a division of forces in support of Italy in the Mediterranean area brought about no noticeable decline in the number of aircraft in operation as compared with the autumn months, because not only had the units been brought up to strength but new ones re-equipped with new aircraft types had been supplied from Germany.

The heaviest night attack on London was made in April, with a total of 711 aircraft over the target (the operation consisted of a double attack) dropping a bomb load of 1,026 tons of H.E. and 150 tons of incendiary bombs. Also worthy of mention are the two heavy attacks on Glasgow in May, 1941.

On 22nd May, H.Q. of Luftflotte 2 was moved to Poznan. At the beginning of June the units belonging to this Luftflotte also moved to the East. In the West, Luftflotte 3 took over command of all G.A.F. forces remaining there.

III

The separate stages of the air war against Britain, begun in August, 1940, with the aim of *securing mastery of the air*, show how it was converted into a phase of the *economic war* with the concomitant *attack on the civilian population*.

In the following we will endeavour to show why the air war assumed this character and finally ended without a decision. In this way general lessons may be learned. Today when the battle for the air is as yet undecided within the framework of the war as a whole, it is, perhaps, too early to lay down hard and fast laws. Only when the enemy's history of the war supplies the necessary complementary information will it be possible to lift the veil from many assumptions and uncertainties.

The waves of attacks by the German Air Force between *August and October*, 1940, were later described by the British High Command as *The Battle of Britain*, whereas today this definition is used for the whole of the events up to June, 1941. The enemy has credited the "Schlacht um Britannien" (Battle of Britain) with decisive influence on the progress of the war and gives for the failure of the German air offensive the following reasons:

1. Inadequate defensive armament of German bombers.
2. Inadequate bomb load.
3. Dispersion of effort, and failure to maintain attacks against any selected targets.

Seversky, the aircraft engineer, who is highly esteemed in America, establishes in his book, *Victory Through Air Power*, that the exclusively tactical flying equipment of the G.A.F. put the latter in the necessary favourable position for an *operational* air war against England, but that it was not suited to the *tasks which presented themselves subsequently*. Germany had failed to develop the right weapon in good time. The enemy maintains that he has profited by German mistakes in developing an operational air force capable of deciding the war and that he is using it in accordance with its own laws.

All those opinions contain a grain of truth. It should, however, be remembered that the air war of 1940-41 *can only be judged in relation to the situation as a whole as it was at that time.*

Two months, at the outside, were available *to gain mastery of the air*, because continued major operations in the air are impossible during the autumn and winter

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months. The carrying out of an invasion of Britain—finally cancelled on 16/1/41—also involved difficulties directly due to the season (from the middle of October onwards).

The *strength* of the *British fighter defence*, on which the German daylight attacks and the hopes of the coveted mastery of the air had come to grief, had perhaps been underrated. *The time estimated as needed for the achievement of absolute superiority in the air was insufficient.* Moreover, during the decisive months the weather had greatly interfered with our plans and repeatedly allowed the enemy time to recover.

In view of their heavy losses, however, it appears quite probable that *the British fighter forces were faced with a crisis at the time the daylight attacks came to an end.* In view of its strength the G.A.F. was in a position to continue daylight attacks, as can be seen from the comparison between aircraft production (i.e., reserves) and the degree of serviceability and losses during the months concerned (see Appendices 1-3). A real weakening as compared with the position prior to the daylight attacks was perceptible only in the case of the fighter units. (Serviceability on 1st September, 1940, 25 per cent. less than on 1st August.)

The operational state of the British fighter arm probably registered an equal, if not greater drop in serviceability.

In view of the conviction of the inevitability of an imminent clash with the Soviet Union the G.A.F. could certainly not be unduly weakened. In this connection the statements of the Führer on the failure to invade in 1940 because of the danger from the Soviet Union in the East should be remembered.

Any consideration for these events must, therefore, take into account the fact that *the struggle of* 1940 *for the mastery of the air, when discontinued by Germany, had not been fought through to a decision.*

Amongst the *tactical* raids, which were to assist in the defeat of the British air force, the value of *attacks on the ground units had, perhaps, been overrated.* Following the pattern of previous campaigns of this war, Britain had to count on heavy attacks on her airfields. Not only were reserves of aircraft placed in readiness, but the fighter forces were withdrawn to the Midlands during the critical weeks. In addition the park-like English landscape offered adequate facilities for take-off and dispersal. With the great numbers of airfields at the disposal of the British air force, attacks against ground units need especially thorough consideration. Attacking aircraft industry may be productive of more enduring results, which do not, however, become perceptible for some time.

After the abandonment of the struggle for mastery in the air the *commercial and economic war* was inaugurated with almost uninterrupted attacks on London. The impact of the air war at that time can be judged from the fact that attacks against London were carried out every night (except seven) from 7th September to 7th November, 1940, with an average strength of 166 aircraft per night.

The enemy's power of resistance was stronger than the medium of attack.

Perhaps the effect of air warfare on the morale of civilian populations is too highly assessed. This is also confirmed by the bearing of the German people in spite of the continued terror attacks by the enemy—which have now been in progress for two years. While the morale of the population is unbroken, air attacks achieve the opposite effect to that desired, namely a hardening of the will to resist. The *success* of this form of warfare, therefore, depends on the *national character of the people attacked* and the *strength of the government* of the state.

Damage to the most varied aspects of the national economy was great, as was confirmed by photographic reconnaissance reports from abroad and from agents. But it did not suffice to paralyse the war industries.

The influence of the attacks on *aircraft production* at that time are undeniable (see Appendix 4). It was, after all, a full year before the enemy air force was able to launch effective counter-strokes.

It is difficult to compare the total extent of destruction and the actual material results of this exclusively aerial warfare with the damage done to the Reich. A comparison of total bomb loads (tons) dropped on Britain during the night attacks

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between August, 1940, and July, 1941, with those dropped by the enemy in his night attacks of 1943 against the Reich, shows that over an equal period of about ten months the R.A.F. dropped a weight of bombs four times greater. In considering this comparison it must be remembered that these figures are not to be regarded as a gauge for the results of any air war. The proportion of H.E. to incendiary bombs, the different effects of the bombs (e.g., of phosphorus and "electron" incendiaries) the conditions of each attack, the state of A.R.P. precautionary economic measures, the intensity of the individual attacks and their concentration against a selected area (gradual destruction of the most important vital centres) are all relevant and important determining factors. Bomb loads dropped in each case during the major attacks are shown in Appendix 5.

In view of the reduction in the forces remaining in the West at the commencement of the Eastern campaign (e.g., eight as against 44 bomber Gruppen) a continuation of the air war in its previous form could only be less successful.

The remaining fighter units were needed to ward off the increasing number of penetrations into the occupied Western territories. On the whole, they made almost no further operational appearances in the air war against Britain.

Of the bomber units those who bore the brunt of the battle of 1941-42 were: K.G. 30 and K.G. 2; in 1942-43: K.G. 2 and K.G. 6. Those Geschwader were stationed in Holland (K.G.2) and Belgium-N. France, 2 Coastal Gruppen (Ju. 88), were, until the middle of 1942, still available. In addition, bomber Gruppen from other theatres of war (e.g., Mediterranean) were called in for short periods.

Long-range reconnaissance (one long-range recce Gruppe remained in the Western sector) was seriously and increasingly hampered in its tasks by strong enemy fighter forces. Photographic target material could be obtained on the South, South-West and East Coasts of Britain only. By the end of 1942 this also had become impossible. Only the use of single-engined aircraft (Me. 109) for long-range recce permitted renewed flights up to the British South and South-East Coast in 1943; such assignments continued to be very difficult in execution, however.

It was important to employ the modest forces available together with the Navy in the attacks on British imports, by:

(*a*) Attacks against the most vital ports.
(*b*) Mining shipping routes.
(*c*) Destruction of shipping in the seas around Britain and in the Atlantic.

The continuation of attacks on the British aircraft industry to hamper its production as much as possible was also aimed at. For this purpose great importance was attached to the carrying out of hit-and-run raids. *The battle against British shipping*, begun at the outbreak of the war, was also continued with limited forces during the autumn and winter of 1940-41. Fliegerdivision 9, formed on 1st February, 1940, had carried out this task successfully by intensifying aerial mine warfare. Enlarged to become Fliegerkorps IX, the bulk of the bomber forces operating against the British Isles was concentrated under this command as from July, 1941. "Fliegerfuhrer Atlantik," set up in March, 1941, took over, in closest co-operation with the German Navy, responsibility for patrolling the western approaches from the West Coast of Britain down to the Iberian Peninsula.

Because of weather conditions, *attacks* against the most important *harbour targets* (e.g., Liverpool or Newcastle) using the tactical methods hitherto successful became secondary to importance, after the autumn of 1941, to mining operations and attacks on shipping.

Since the most modern bomber types of those days, Ju. 88 and Do. 217, were mainly in operation against Britain from July, 1941, losses were small.

N.B.—The two coastal Gruppen, already dissolved in the first months of the summer of 1942, were both under the command of the staff of the "Führer dor Luftstroitkräfte," until this was dissolved in 1942. From that time Fliegerkorps IX carried on the air war against Great Britain alone.

Mining operations of the following months were directed against the approaches to the large supply ports northwards as far as Newcastle and Liverpool.

The introduction of new mines (magnetic and acoustic) made enemy mine-sweeping

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operations more difficult. Apart from direct successes from destruction or damage of shipping—successes which become known either much later or never at all—interruptions occurred in the flow of regular supplies to the British Isles, furthermore, personnel had to be diverted from the Merchant Navy for the necessary minesweeping operations.

The coastal waters between the mouth of the Thames and Flamborough Head offered favourable opportunities for attacks on shipping, especially as the northbound and southbound convoys passed at regular times along fixed routes. Conditions were less favourable along the South and West Coasts of Britain.

Attacks on *shipping targets* were carried out making full use of the element of surprise in daytime, at dawn and dusk or during nights of good visibility according to weather conditions. Bombing attacks were made at low level or in a shallow dive with bombs of 250 Kg. or 500 Kg.

The mainly shallow waters on the British East Coast made the use of torpedoes appear somewhat pointless. The successes achieved in 1941 with small losses to ourselves were good. As an example the result for the month of November may be given. These were: Sunk, 82,100 gross register tons; probably sunk, 49,000 tons; damaged, 66,000 tons.

The position changed surprisingly at the beginning of the year 1942. Anti-aircraft defence aboard the vessels and protection of the convoys by fighter aircraft had been strengthened considerably. For instance, K.G. 2 lost during five weeks (February-March, 1942) 13 crews after scoring only slight successes.

A fundamental change in the conduct of air war took place from April, 1942, when reprisals were called for as an answer to enemy terror attacks against the Reich which began at that time.

Increasing in volume from month to month, the war against the civil population again took prominence over the other tasks, though efforts were made to maintain the latter. Moreover, because of the growing danger of an invasion of the Western sector (Second Front), special preparations had to be made. A decisively important part in combating the approaching enemy, who was to be repelled if possible before reaching the mainland, was attributed to all available G.A.F. forces.

Reprisal action opened with massed attacks on the cities of Exeter and Bath. For this all bomber units of Luftflotte 3 were called upon. Even training crews of the fourth Gruppen were unexpectedly ordered to take part. In the course of further raids, the latter, which were still operating with aircraft like the Do. 17a and He. 111, sustained painful losses. Thus, within a short time the training programme, the importance of which was constantly increasing, lost valuable training personnel (instructors).

Following the tactics so successfully employed by the enemy against *Lübeck* and *Rostock*, concentrated raids of short duration were carried out for the first time to minimize defensive action. Outward flights were made along a single, approximately common course in stepped-up formation. Incendiaries and flares were used to light up the target as before.

The raid on Bath had a really annihilating effect. During the night of 25th-26th April, only four aircraft out of a total of 151 (each aircraft making two flights) were lost (duration of raids, 30 minutes each).

In the period following, reprisal raids were carried out on the lines of the Bath one while the *moon was full*. Amongst others, for instance, Sunderland, Newcastle, York, Norwich, Bradford, Canterbury and Weston-super-Mare were bombed by an operational force of 40-70 aircraft. The enemy defence, becoming increasingly effective with its single and twin-engined night fighters, made it necessary to reduce still further the duration of the raids (to 10-20 minutes by the end of 1942), and each aircraft had in particularly dangerous zones to take continuous evasive action (sudden changes of course and height smartly executed). The Ju. 88 and Do. 217 squadrons engaged exclusively in shallow dive-bombing. The H.Es. used were mostly of 500 Kg. calibre with some S.C. 1,000 RDX or aerial mines. To supplement the electron incendiaries, explosive incendiaries were introduced from the summer of 1942 onwards. The ratio in weight of H.E. to incendiary was 1 : 2.

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Mining operations were carried out during the other half of the month, or when the weather was unsuitable for massed raids. *Attacks against shipping* by day ceased; attempts to carry them out on dark nights continued, however. But these attempts failed as it proved impossible to spot a convoy even with the necessary radio intelligence and visual recce by day—without having naval radar search equipment. *Full advantage was taken of weather suitable for nuisance raids*, by day. The almost daily operations of April to August, 1942—the last raids on Birmingham also fall within this period—made the *greatest demands* on the crews. The bombing force dwindled (e.g., average operational strength of K.G. 2 during January, 1942: 88 crews; September, 1942: 23 crews). Further casualties were suffered in warding off the Anglo-American invasion attempt at Dieppe on 19th August. There K.G. 2 lost 25 per cent. of the aircraft which went into action.

In September and October, 1942, operations were confined to *nuisance raids* by day and night and *mining operations*, the aim being to shield the squadrons from loss as far as possible. But even this did not result in any noticeable reduction in the losses.

The march into unoccupied France claimed almost the whole of the bomber units based in the West, who were thus provided with a much-needed breathing-space.

At the end of 1942, not only were the personnel of the bomber units reinforced, but technical improvements were made in the aircraft types, as for example installation of night fighter early warning apparatus (Lichtenstein Gerät BCR or Neptune-Gerät), of the Fu.G. 101, and treatment of the surface of the airframe to increase speed.

Tactical experience had shown the importance of *radar plotting* in the enemy's defence. During the following months a decrease in losses was achieved by flying below the *effective detection range* of the radar sets (low-level approach and withdrawal).

From February, 1943, pressure on the Reich from enemy bombing attacks again enforced the *resumption of reprisal raids* on a larger scale. Hopes for substantial tactical advantages from technical improvements were not fulfilled. Though results from attacks were often only mediocre, largely as a result of unfavourable weather conditions, losses again rose sharply (for example, K.G. 2 alone lost 26 aircrews during March, 1943).

The difficulties of the air war against Britain had reached their culminating point. With effect from 1st April, 1943, the command of O.C. attacks against British was placed directly under the C.-in-C. G.A.F. and employed to intensify the whole of the war against Britain. Fliegerkorps IX continued to function, however, so as to be able to take over executive command in the case of invasion. It took over the tactical command of units again by the middle of June, 1943, as the O.C. attacks against Britain had been given new tasks on the Mediterranean front.

The following months led by stages to the conduct of the war as it is today. *Mining operations, nuisance raids by heavy bombers by day and night and the demands for hit-and-run raids were gradually* suspended. In this connection results obtained in minelaying operations, in attacks against shipping and in the *nuisance and hit-and-run raids* should be mentioned.

Up to 31st December, 1943, the following successes were announced by Fliegerkorps IX:

(*a*) *Mining operations from the air:*
Sunk, 355 vessels totalling 619,600 gross registered tons.
Probably sunk, 55 vessels totalling 146,200 gross registered tons.
Damaged, 283 vessels totalling 643,140 gross registered tons.
Total, 693 vessels totalling 1,408,940 gross registered tons.

(*b*) *Air attacks on shipping:*
Sunk, 43 vessels totalling 166,880 gross registered tons.
Probably sunk, 38 vessels totalling 171,000 gross registered tons.
Damaged, 118 vessels totalling 439,200 gross registered tons.
Total, 198 vessels totalling 777,080 gross registered tons.

(Successes from minelaying diminished from the autumn of 1942 as the enemy became familiar with the peculiarities of the mines and was therefore *able to* apply appropriate minesweeping measures.)

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The daytime nuisance raids were almost exclusively spread over the southern and south-eastern area of England, and from 1943 did not extend beyond the latitude of London into the Midlands. In this type of operation, consisting of bombing and strafing, bomber units suffered in attacks on densely populated built-up areas comparatively heavy losses. A great number of operations had to be abandoned because of weather conditions. Fighter-bomber attacks which had been carried out from Spring, 1942, until May, 1943, on targets in South and South-East England and on shipping along those coasts had also proved too costly in relation to the results achieved. Therefore nuisance raids were carried out thereafter by night only by the two new high-speed bomber Gruppen, one being equipped with Fw. 190, and the other with Me. 410.

Precision raids had only a limited success. Two factories, a ball-bearing factory at Chelmsford and an airframe factory at Leamington, near Birmingham, had been successfully attacked in 1942.

From *April*, 1943, *massed air attacks*, chiefly against *targets close to the coast* (e.g., Hull, Norwich, Ipswich, Chelmsford, Portsmouth, Plymouth, Cardiff and others) were only made during full moon and then only if the weather promised as far as possible, a good likelihood of success, i.e., only under absolutely perfect weather conditions. Operational strengths were about equal to those of the spring and summer months of 1942.

During *intervals between operations*, brought about by the reduced scope of their tasks, the efficiency of aircrews could be improved by thorough and comprehensive *training*, especially in navigation and bombing. These operations, which were planned, could be prepared with the greatest precision.

Technical changes included the replacement of the Do. 217 and Ju. 88.

It had been recognized in the case of the Do. 217 that its defensive armament, which was admittedly stronger by comparison than that of other German bombers, represented no advantage in a total war, and that its greater weight rendered evasive action more difficult and made it a readier prey to night fighters when once these had tracked it down.

Apart from the existing *navigational aids*, new ones were introduced and older ones reintroduced (Knickobein). In conjunction with the increased use of pathfinders (course marking, target location, target marking) and the allocation of those tasks to a special Gruppe (I/K.G. 66), such aids rendered it possible to concentrate attacks to a greater extent and made operations less dependent on weather and moonlight.

Counter-measures were introduced against the very harassing effect of long-range British night fighters in collaboration with the light flak allocated to G.A.F. stations. These measures are now being adopted throughout the G.A.F. (switching off some flare-path lights, staggering light flak guns along the line of approach of landing aircraft.

In spite of these innovations, there was only a slight decrease in losses. Only the use of *tinfoil strips ("Window") to interfere with the enemy radar* brought some relief. At the same time methods of attack were altered. The outward flight at low level was no longer pursued to within a short distance of the British coast where the necessary altitude for the attack was gained by a sharp ascent in the face of massed enemy night fighter attacks. Instead, the low-level approach was abandoned earlier, and the aircraft rose steadily to the desired altitude (switch-over to the tactics of bomber streams). This also made it possible to dispense with the evasive movements which interfered with accurate navigation.

Mention must also be made of the successful *long-range night-fighting activities* of the high-speed bomber Gruppe of Me. 410s (V/K.G. 2) during August and September, 1943, which were later again abandoned in favour of nuisance raids by night on London. No long-range night fighter operations against Britain had been carried out since the summer of 1941.

During the last two months of the year 1943 preparations were made for *heavy attacks on London.*

The opening of these attacks, scheduled for the Christmas period, was delayed by

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the weather. The strength attained by the enemy defences showed that a tolerable ratio of losses results could only be achieved by operating with forces of 200-300 aircraft in massed attacks. Therefore, in addition to the preparations already mentioned, the number of bomber Geschwader operating against Britain was increased. In this connection a statement by Churchill will be of special interest: "We must saturate their defences."

Appendix 6, an analysis of operational conditions in 1942 and 1943, may be taken as an example of the above.

V

The air war, as conducted against Britain from the beginning of the Eastern campaign, was in the nature of a *battle of inferiority* by smaller forces against a superior, highly-developed defence which was steadily gaining in strength and precision. The task which had been easily performed previously by 600 bombers had now to be carried out by 60, which was the total average daily operational strength of all bomber units in 1942 and 1943, compared with 150-200 bombers (which is the present figure).

To plan and carry out this air war on a long-term basis and to achieve the best possible results, any decline in battleworthiness, as also dispersal of effort, had to be avoided. The most important lessons gained from this period was the necessity of concentrating one's forces whether for a mass attack or for smaller individual operations. At the same time the principle of economizing one's forces must be observed, especially as a high degree of operational vigilance must be continuously maintained in view of the threatened invasion. Of special importance is an *unfailing supply of fully trained replacements*. It is not possible to accustom crews gradually to the growing difficulties of operations against Britain. With the present rate of tactical and technical development, the tasks to be solved in training become extraordinarily complex. *Fighting power is the product of quality and quantity*. Even units in contact with the enemy have to be instructed and given further training; every operation, in view of the mass of detail to be taken into account, must be prepared minutely.

In no other theatre of war are changes resulting from the reciprocal effect of technical and tactical developments, offensive and defensive weapons so acutely and speedily perceptible.

During the years 1942-43 the enemy found, usually within one to one-and-a-half months, an answer to every new method of attack. Whenever air war assumes the character of a war of position, technical and scientific factors must predominate.

The importance of the radar system may be taken as an example of this.

Britain, whose vital centres are crowded into small areas always within a short distance of the coast or even lying on the coast itself, must aim at detecting every attacker long before he reaches the coast so as to be able to meet him with the full weight of the defences. It is, therefore, not surprising that the enemy made wide use of radar for intelligence purposes and plotting, and achieved a notable lead over Germany in its use. Like the quills of a hedehog [*sic*], the invisible feelers of her *radar, which is the prime obstacle to overcoming enemy defences,* reach across and around Britain. Appendix 7 shows how the long range of British ground radar influenced the tactics employed in massed raids.

In analysing the failure of the tactical rules of the time it was often necessary to depend *entirely* on an exhaustive examination of the attacks carried out. Close and direct collaboration with all authorities concerned with observing enemy activity, the *Reich air defence authorities* and the *technical development and research department* would perhaps have made it possible to find the answer to many problems sooner. The necessity for this collaboration, which can never be too close, will always exist, as no *ready-made solution* of the problems of the air war against Britain can be expected in the future.

VI.

An attempt has been made in the above to break up the air war against Britain into logical and consequent phases and to extract from each of them the lessons learned.

In view of the abundance of material only the most important factors could be taken

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into acount. Many individual lessons of a technical or organizational nature have had to be left unmentioned.

To assess the importance of the present air war against Germany's vital resources, a war regarded as potentially decisive by the enemy, it is essential to be acquainted with the facts of the German air war against Britain. In particular, the course of the "Battle of Britain" must be borne in mind.

It may now be stated without optimistic exaggeration that the enemy's expectations with regard to the effects of operational air war (e.g., as indicated in the "Master Plan") have not yet been fulfilled. A fierce conflict of opinion has flared up and reached public expression among our Western foes as to the value of this particular mode of war.

In conclusion, this treatise is not intended merely to suggest comparisons and encourage a careful evaluation of the enemy's present air policy, it should make it possible to assess how the G.A.F. with its present resources can be most effectively employed against Britain in the light of the experience gained.

There are three possibilities for the air war against the British Isles:

1. The invasion of Britain.
2. Destruction of the vital centres of British life.
3. War against the supply lines of the island.

The G.A.F. has a decisive part to play in connection with all three possibilities. In view of the present war situation no answer need be given to the question of an *invasion of England*. The choice lies between the two other possibilities.

With regard to the problem of the *destruction of the vital centres of British life*, a policy which would have to be put into effect entirely by the G.A.F., the following should be noted:

What the G.A.F. could not achieve in 1940-41 could hardly be achieved today with smaller forces, especially as the U.S.A. has joined our opponent. Britain could continue to exist even if the sources of strength lying in its own territory were destroyed, as the mighty economic and war potential of America would be at her disposal as before. It is also difficult to assess the probable effects of the air terror on the civilian population inevitably associated with such a policy as with every type of reprisal. What a stupendous air force the enemy has created to overthrow the German people and its allies by the same method!

If, indeed, this policy is to be pursued, the G.A.F. must be reinforced or supplemented with new and more effective weapons.

If, in spite of all these considerations, the G.A.F. is to be called upon to implement this policy, it must only happen if primarily political considerations of home and foreign policy demand it.

Finally, as to the war against *Britain's supply lines*, this is the policy which promises the greatest measure of success for the G.A.F., and it should be carried out in collaboration with the naval authorities. The importance of the supply movements to the Allied war effort is enormous.

At the present moment the defence of the European mainland is the prime consideration of our policy. The decisive battle with the combined Anglo-American air forces is being fought out over our vital living space. While this imposes on the G.A.F. other and more urgent tasks, the attempt should nevertheless be made to implement the last of the three policies mentioned in the Western theatre of operations in view of the general war situation.

EFFECTS OF ATTACKS ON GERMAN SYNTHETIC OIL PLANTS (JUNE, 1944)

(A verbatim translation of a personal report, made by Speer to Hitler on 30th June, 1944; the subject is the very serious damage to the German economy which had then already resulted from the Allied attacks on the synthetic oil plants)

My Fuhrer, *30th June*, 1944.

In the course of June the enemy's attacks on the synthetic oil plants and refineries were carried out with increased strength. By means of his continuous air reconnaissance

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and espionage, he was again able to inflict heavy damage on those plants which had been hit in the previous month—plants which were mostly just coming into production again.

Although you, my Fuhrer, are kept continuously informed through the agency of General Keitel of the severity of the attacks and the losses which result from them, yet I feel it my duty to give you an additional review of the losses to the German fuel production since the beginning of last May, as well as to point out the most urgently necessary measures which should be taken as a consequence of them.

(1). In May and June the attacks were concentrated on the German aviation petrol production.

The enemy thereby succeeded, on 22nd June, in bringing the loss of aviation petrol up to 90 *per cent.* Only through the most rapid repair of the damaged plants, whose return to production was in every case far in advance of the originally laid down date, will it be possible to restore a part of the catastrophic loss of 22nd June. *Nevertheless, the output of aviation spirit is wholly insufficient at present.*

In April the Luftwaffe consumption of aviation spirit was 165,000 tons, while 175,000 tons were produced.

Thus, the daily average production for April was 5,850 tons.

In May the following are the daily production figures:

May 1 to 11	5,645 tons daily	
„ 12 (Attacks on Leuna and Brüx)	4,821	„ „
„ 13	4,875	„ „
„ 14	4,842	„ „
„ 15	4,775	„ „
„ 16	4,980	„ „
„ 17	4,839	„ „
„ 18	4,920	„ „
„ 19	5,010	„ „
„ 20	4,975	„ „
„ 21	5,025	„ „
„ 22	5,075	„ „
„ 23	5,051	„ „
„ 24	5,073	„ „
„ 25 (Leuna begins 20% production)	5,487	„ „
„ 26	5,541	„ „
„ 27	5,550	„ „
„ 28 (Second attack on Leuna; 100% fall in production)	5,526	„ „
„ 29 (Attack on Politz; 100% fall in production)	2,775	„ „
„ 30	2,743	„ „
„ 31	2,794	„ „

Thus, the total actual production for May was 156,000 tons of aviation petrol, against a capacity production of 180,000 tons.

In June the following daily production was achieved:

June 1	2,476 tons daily	
„ 2	2,535	„ „
„ 3	2,580	„ „
„ 4	2,555	„ „
„ 5	2,511	„ „
„ 6	2,326	„ „
„ 7	1,823	„ „
„ 8	3,718	„ „
„ 9	2,756	„ „
„ 10	2,873	„ „
„ 11	3,052	„ „

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June 12	2,120 tons daily	
„ 13 (100% loss of production at Gelsenberg, short restriction at Welheim)	1,078	„ „
„ 14	1,587	„ „
„ 15 (Short restriction at Scholven)	1,527	„ „
„ 16	1,275	„ „
„ 17	1,214	„ „
„ 18 (Scholven attacked again; slight loss of output)	1,323	„ „
„ 19	1,278	„ „
„ 20 (Attack on Pölitz postpones the return of the plant to production till August)	1,392	„ „
„ 21	1,268	„ „
„ 22 (Scholven production falls 20%; Wesseling production falls 40%)	632	„ „
„ 23	868	„ „
„ 24 (Leuna begins again with 20% production) ...	1,268	„ „
„ 25	1,223	„ „
„ 26 (Moosbierbaum production falls by 100%) ...	1,204	„ „
„ 27	1,252	„ „
„ 28	1,241	„ „
„ 29	1,237	„ „
„ 30	1,218	„ „

The total production for June was, therefore, 53,000 tons of aviation petrol, against a consumption for May of 195,000 tons.

After the first attack of 12th May, you were told by the Obersalzberg that the output for the month of June would be 126,000 tons of aviation petrol. This total would certainly have been exceeded, owing to the increased speed of repairs. Owing to the continuing attacks of the month of June, production fell considerably short of the stated total. In this connection, it must be pointed out *that the production of the second half of June has again fallen considerably and is only at the rate of* 42,000 *tons a month, which leads to the certain conclusion even today, that there will be an extraordinary fall in the July production if the attacks continue.*

(2). The following are the figures of M.T. spirit production in Germany:

In April	125,000 tons
In May	93,000 tons
In June probably only	70,000 tons

Including imported fuel, the June amount should reach about 96,000 tons, while the April consumption was 205,000 tons.

The diesel fuel production for Germany was:

In April	88,000 tons
In May	74,000 tons
In June	66,300 tons

Including the amounts imported, the quantity available for June will total 94,000 tons, while the April consumption was 194,000 tons.

As a result of the destruction of the synthetic plants, producer-gas, which served as the most important substitute for petrol on the home front, fell from the April production and consumption figure of 37,600 tons to 10,400 tons for June.

As a consequence of the events of June, one can work out when the small fuel reserves will have been used up.

In this respect the loss of aviation spirit is the more important, as virtually the whole of this type of fuel is produced in Germany, so that no improvement can be sought from imports.

As one must reckon, even in the most favourable conditions, at least six to eight weeks, according to the severity of the damage, to restore the productive capacity of

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the synthetic plants now damaged, each week in which no additional protection is provided for the synthetic plants will be of the gravest importance. The drop in production for June and the small amounts which can be expected in July and August in the present state of air attack *will doubtless use up the greater part of the reserves of aviation spirit and other fuels.*

Thus, the repair of these plants, as the experience of June demonstrates, will be useless unless we succeed in taking all possible measures to protect the synthetic plants and refineries. *Otherwise it will be absolutely impossible to cover the most urgent of the necessary supplies for the Wehrmacht by September, in other words, from that time onwards there will be an unbridgeable gap which must lead to tragic results.*

For my part, I have ordered the following measures, *inter alia*, to be taken:

1. The most rapid repair of the damaged plants with the maximum expenditure of labour and material.
2. Additional protection is to be afforded to the most vital parts of the plants and to those workers who are urgently needed in the plants during attacks. For this purpose, Geilenberg and Dorsch have together laid down a priority programme whereby 800,000 cubic metres of concrete will be supplied.
3. The head of the military motor transport has laid down a special programme for fitting military transport with generators. The output of the necessary generators is assured. The supplies of wood will be obtained through ruthless felling.
4. My Planning Office (Planungsamt) cut down fuel consumption in June on the home front, including water transport and the building industry by 35%; for July a further cut of 23% must be expected; in other words, a total cut of 42% of the May allocation.

Doubtless, the Wehrmacht has also taken measures which have been rendered necessary by the present position. Yet, I consider it as my duty, all the same, to bring out the following points:

1. The strictest measures must be taken, even today, to reduce flying as far as possible. From now onwards no flight which is not directly needed for battle, training or testing must be carried out. In a couple of months we may grievously regret every ton of fuel which is now used up unnecessarily, for already today the increasing fighter programme bears no relation to the falling fuel production.
2. The strictest measures are also needed with regard to the consumption of petrol and diesel fuel by the Wehrmacht. At the same time it must be worked out how the war should be carried on if only a part of the present quantity of fuel were available.
3. The fighter protection for the plants must be considerably increased, for the Luftwaffe must clearly understand that, should the attacks continue successfully, they will, anyhow, only be able to operate with a part of their fighters by September, owing to a lack of fuel.
4. Reconnaissance makes it easy for the enemy to ascertain the return to production of the plants and thus enables him to bring production to a standstill a short time later.

   The enemy will not assume that we have restored the synthetic plants in this short time and would, without reconnaissance, leave longer pauses between his attacks, which would allow us at least a partial production.
5. A considerably greater use should be made of smoke units, even if this meant moving them from other important targets. It should be laid down that, in addition to smoking the target itself, a dummy plant should be built in the vicinity and also smoked to improve the camouflage, as the white smoke indicates that the plant must be concealed beneath it.
6. Despite the already strengthened Flak, a further Flak defence should be provided, even at the expense of the protection of German towns.

   This additional Flak protection must be provided for all synthetic plants and

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refineries, even if they are still in the course of construction and will only come into production in one to two months, such as Hydebreck and Blechhammer.

If we do not succeed in protecting the synthetic plants and refineries better than in the past, then an unbridgeable gap will appear in the fuel supply of the Wehrmacht and the homeland. The protection which has already been provided proved to be of some help during the last attacks without, however, improving the position decisively.

I must draw your attention, my Fuhrer, to the serious development in the field of fuel production. I beg you to take the strictest measures to provide additional protection for these plants.

(*Signed*) SPEER.

REPORT OF ROMMEL AND VON KLUGE

(The following are translations of captured German documents. The report of Von Kluge was dated 21st July, 1944, and that of Rommel, 15th July, 1944)

My Fuhrer

I present to you herewith a report of Generalfeldmarschall (Field-Marshal) Rommel, which he handed over to me before his accident and which he has discussed with me.

I have now been here for about a fortnight and after long discussions with the responsible commanders of the fronts here, especially those of the S.S., have been convinced that the views of the Feldmarschall are unfortunately right. My discussion yesterday with the commanders of the formations near Caen, held immediately after the recent heavy fighting, has particularly afforded regrettable evidence that in our present position—including the material position—there is no way by which, in the face of the enemy air force's complete command, we can find a strategy which will counterbalance its actually annihilating effect without giving up the field of battle. Whole armoured formations, allotted to the counter-attack, were caught in bomb-carpets of the greatest intensity so that they could be got out of the torn-up ground only by prolonged effort and in some cases only by dragging them out. The actual result was that they arrived too late. The psychological effect of such a mass of bombs coming down with all the power of elemental nature on the fighting force, especially the infantry, is a factor which has to be given specially serious consideration. It is immaterial whether such a carpet catches good troops or bad. They are more or less annihilated and, above all, their material is shattered. If that occurs frequently then the power of endurance of the force is put to the highest test. In fact, it becomes dormant and dies. Whatever is left is no longer, as a fighting force, what must be demanded, unconditionally, by the situation. Consequently, the force sees itself opposed to an irresistible power (literally against which not even a blade of grass has grown). This must make itself evident to an ever increasing degree.

I came here with the fixed determination of making effective your order to stand (fast) *at any price*. But when one has to see by experience that this price must be paid by the slow but sure annihilation of the force—I am thinking here of the Hitler-jugend (Hitler Youth) Division which is earning the highest praise—when one sees that the material supplies coming up in almost all areas are, at times, completely insufficient (personnel also) and that fighting material, especially artillery and anti-tank weapons and their ammunition, are largely insufficient for the demands of the command, with the result that the brunt of the defence falls on the good will of the brave troops, anxiety about the immediate future of this front is only too well justified.

I can report that, through the glorious bravery of the troops and the strength of will of the whole command, especially the lower ranks, the front has held till now, although with almost daily loss of ground.

But in spite of intense efforts the moment has drawn near when this front, already so heavily strained, will break. And once the enemy is in open country an orderly command will hardly be practicable with the insufficient mobility of our troops. I consider it my duty as the responsible commander of this front to bring these con-

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clusions to your notice, my Fuhrer, in good time. My last word at the conference of commanders south of Caen was:

"We shall hold out (literally, it will be held out) and if no way-out improves our position fundamentally, we must die (literally, it must be died), honourably, on the battlefield."

The Oberbefehlahaber (Commander-in-Chief) West.

Signed VON KLUGE.

Generalfeldmarschall (Field-Marshal).

OBSERVATIONS ON THE SITUATION

The position on the front in Normandy is becoming more difficult daily and is approaching a serious crisis.

Owing to the intensity of the fighting, the exceptionally strong supplies of material of our foe, especially in artillery and armoured vehicles, and the effect of their air force, which commands the battlefield unchecked, our own losses are so high that the fighting strength of the divisions is sinking very rapidly. Reinforcements from home arrive only very scantily and, with the difficult transport situation, only reach the front after weeks. About 97,000 men (of whom 2,360 are officers) in losses—that is to say, a daily average of 2,500 to 3,000 men—as against 10,000 men in reserve (of whom about 6,000 have arrived). The material losses of the troops engaged are also exceptionally high and have been replaced so far only to a very small extent, e.g., of about 225 Panzers only 17 so far.

The newly brought-up infantry divisions are inexperienced in battle, and, with the small provision of artillery, anti-tank weapons and means of attacking tanks at close quarters, are not in a position to ward off successfully for long hostile major attacks made after many hours of drum fire and heavy bombing. As the fighting has shown, even the bravest unit is shattered bit by bit through the supplies of material possessed by the enemy and thus lose men, weapons and battle territory.

The supply situation is so difficult, through the disruption of the railway network and the great danger on the major and minor roads up to 150 kilometres behind the front through the enemy air force, that only what is most essential can be brought up, and above all artillery and werfer (mortar) ammunition must be spared everywhere to the utmost. These conditions are unlikely to improve in future, as the supply area is perpetually being decreased by enemy action and enemy air activity is likely to become still more effective by reason of their occupation of the many airfields in the bridgehead.

No forces worth mentioning can be brought to the Normandy front without weakening the front of the 15th Army on the Channel or the Mediterranean front in Southern France. But the front of the 7th Army is in urgent need of two fresh divisions, as the forces which are there have been fought to a standstill.

On the enemy's side new forces and masses of war material are flowing to the front daily. The enemy reinforcements are not disturbed by our air force. The enemy pressure continues to get stronger. In these circumstances we must reckon with the fact that the enemy, within a measurable time, will succeed in breaking through our thinly-held front, especially that of the 7th Army, and in thrusting deep into France. I may invite attention to the attached reports from the 7th Army and from the II Fallsch Jg. Korps (Parachute Corps). Apart from local reserves of the Panzergroup West, who are immediately tied down by the fighting on the front of the Panzergroup, and, owing to enemy command of the air, can march only by night, no mobile reserves to defence against such a break-through are at the disposal of the 7th Army. The support of our own air force is, as before, of little weight.

The force is fighting heroically everywhere, but the unequal combat is nearing its end. It is, in my opinion, necessary to draw the appropriate conclusions from this situation. I feel it my duty as Oberefehlshaber (Commander-in-Chief) of the Army Group to express this clearly.

Signed ROMMEL (*Generalfeldmarschall*).

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Making Ends Meet

By Wing Commander H. R. P. Patterson, O.B.E.

As the organ-blower said to the enthusiastic virtuoso when the cantata was two-thirds completed, "Ah've pumped t'organ for forty-five years and Ah knows well there's nine 'undred and twelve pumps in t' 'Messiah.' Whether tha's ended or no tha's 'ad' em."

The same may be said of the Fighting Services. Our numbers are too depleted to permit any elaboration and—as for the original estimates of manpower—we've had them. It makes matters worse that the technical equipment of the R.A.F. increases in variety and intricacy and generally demands more personnel for its operation, maintenance and repair.

How, then, can we economize?

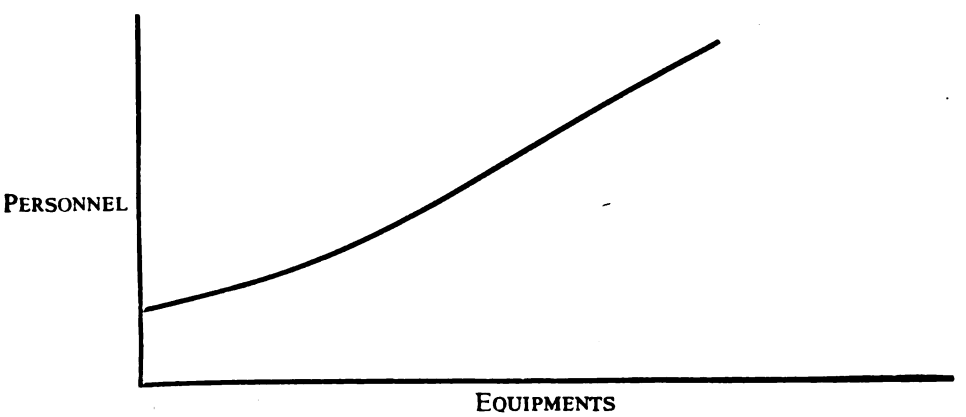
We can begin an analysis of our problem either by defining a certain numerical strength for the Royal Air Force (or a component of it) and working back to the equipment that this force can handle, or by postulating so much equipment and calculating the personnel required. The latter is more striking to illustrate the "snowball" effect of the administrative and domestic staff entailed for every increment of operational or technical strength. In general terms the total personnel needed to operate or service "n" equipments may be expressed graphically as follows. The slope of this curve and its point of origin on the vertical axis are dependant on the economy of the "parasitic" administration required.

It is inevitable under Service conditions that the slope of the curve tends to be steep.

Manifestly, it is imperative to keep the operational and technical strength to a minimum so that the overheads in the "parasitic" Services are correspondingly low. But it is common knowledge that the R.A.F. is desperately short of technical staff and we are driven to seek the solution to our problem in innovations that, at first sight, may seem fantastic.

The ideas suggested in the following paragraphs—in brief, a technical reserve in industry, closely in touch with R.A.F. schemes and requirements—may not be feasible; they may serve, however, to open up lines of thought on how to make ends meet.

The Royal Air Force does not design or make the equipment that it uses (except in a minor way). These functions are carried out in civil-manned research establishments and factories. It follows that the men and women engaged on this work have—or could have—a fundamental and detailed knowledge of the construction, operation, maintenance and repair of the various items which collectively form the battle equipment of the R.A.F. and this knowledge could be acquired without seriously interfering with their productive ability. For instance, a wireless set is mainly fabricated by the joint effort of a number of people performing a pattern of mechanical operations.



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Most of these people need know nothing of the principles or purpose of the apparatus. Even the testing can be "robotized." But there is always a certain number of technicians (in addition to the higher design staff) who are not only intimate with the product professionally, but who, from motives of personal interest, are acquainted with its construction and functions. These are the people who, encouraged, trained and augmented, could be enlisted to assist the R.A.F. in peace and become an integral part of it in war, without jeopardizing the production effort of the country.

The "industrial reserve" would achieve two economies in peace. Firstly, long-term basic technical training in the R.A.F. would be unnecessary; we would only have to train operators, maintenance engineers and "trouble-shooters." We can afford long courses only when we have plenty of manpower to call upon. Secondly, major repair and overhaul would be entirely within the industry where spares, tools, jigs and test equipment would be ready at hand.

In time of war the "industrial reserve" would be called up to serve side by side with regulars of the Service in major repair units and in field servicing, or in factories turned over to production of munitions.

It would be idle to pretend that these proposals are not open to serious criticism. An obvious comment is that for a given task or tasks a particular number of men is required whether they are in the Service or in industry. The counter argument is that under present arrangements we have duplication of effort, especially in training, which, desirable though it may be strategically, is uneconomical in manpower and improvident under present circumstances. Ideally, we should have training, manufacture, repair and test in the factory and operation, inspection, and light maintenance in the Forces. It is true that industry would have to be expanded to deal with these commitments, but the load on the Service would be more than correspondingly lightened. It is important, too, to remember that every technician in the Service has to be housed, clothed and fed, demanding, in turn, more and more auxiliary staff and equipment. These "overheads" are not nearly so extensive under civil conditions. A second objection which may be advanced is that in time of war the R.A.F. needs to be self-contained, especially overseas, for the full maintenance and salvage of its equipment. Future wars may be so intense as to rule out the establishment of Base Repair Depots. The operational force may have to be provided with ample replacements, and damaged equipment may have to be discarded. In the recent war it was apparent that, had our resources been sufficient, repair of certain equipment was unwarranted. Even if "Service Repair Units" are needed in war we can hold machine tools, rigs and test gear in reserve and man them from the "industrial reserve."

Whether these suggestions have any merit is perhaps a minor consideration. Other ideas, for instance, the integration of the technical Services of the Army, Navy and Air Force, are not lacking. What is important is that we recognize the problem before us and step out to meet it. If we fail to do so we may find our technical standard declining and our mechanics men whose little learning is a dangerous thing.

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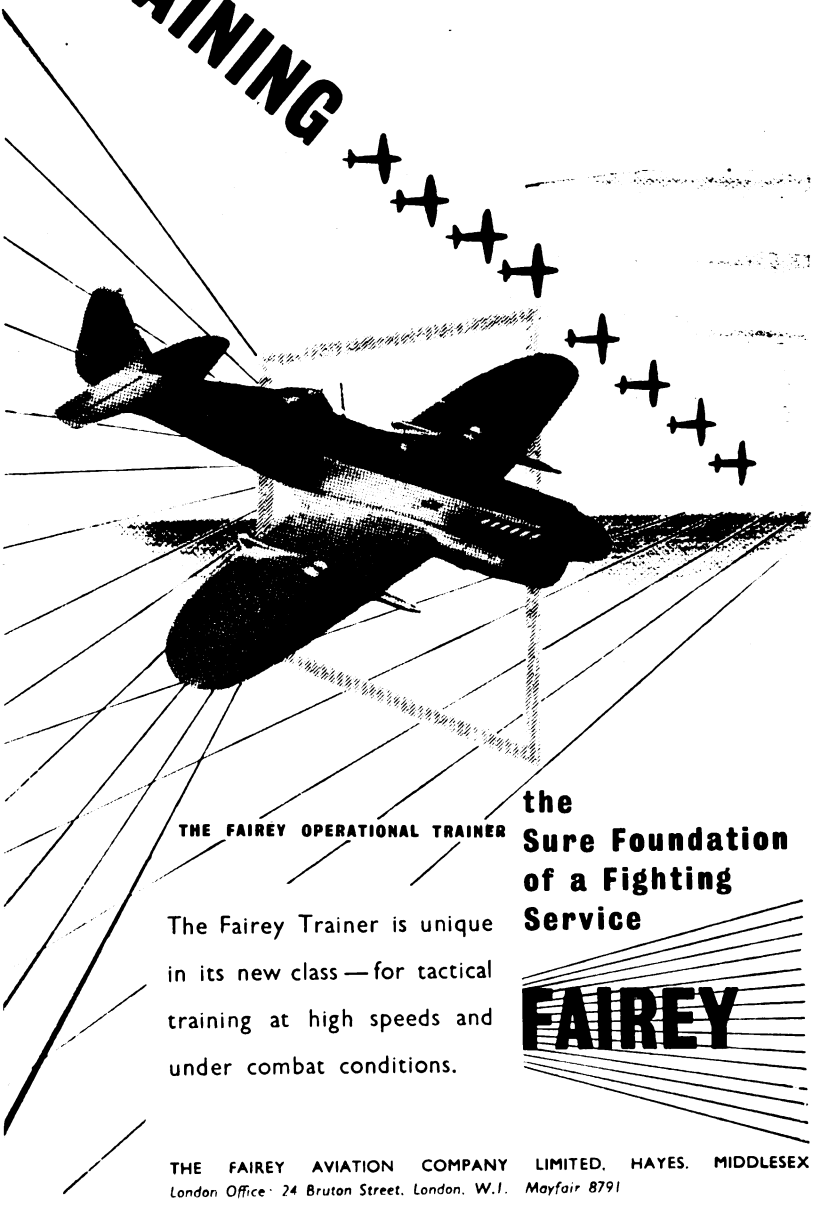

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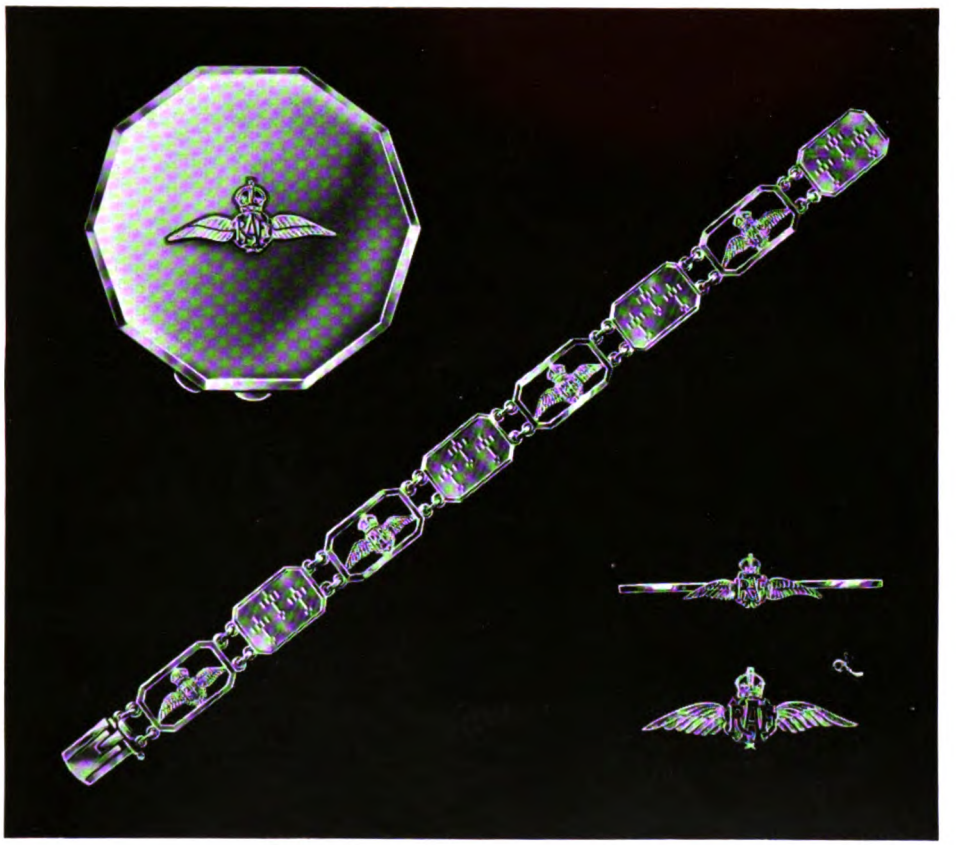

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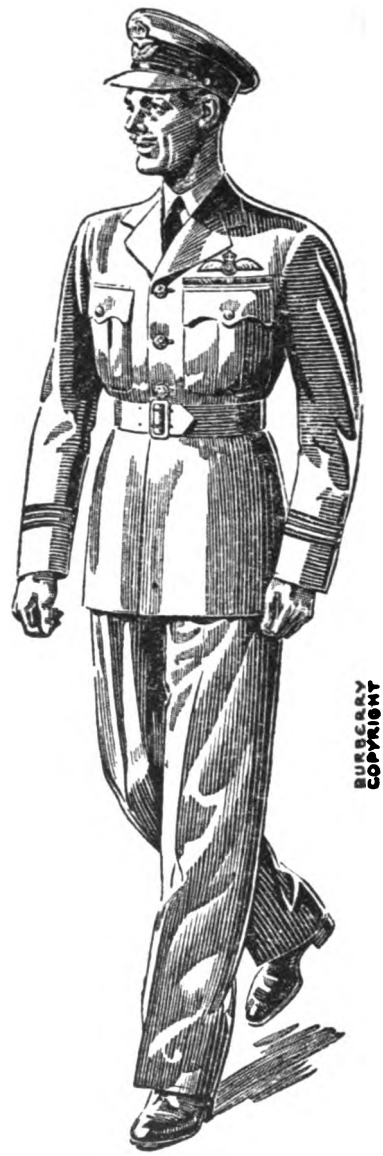

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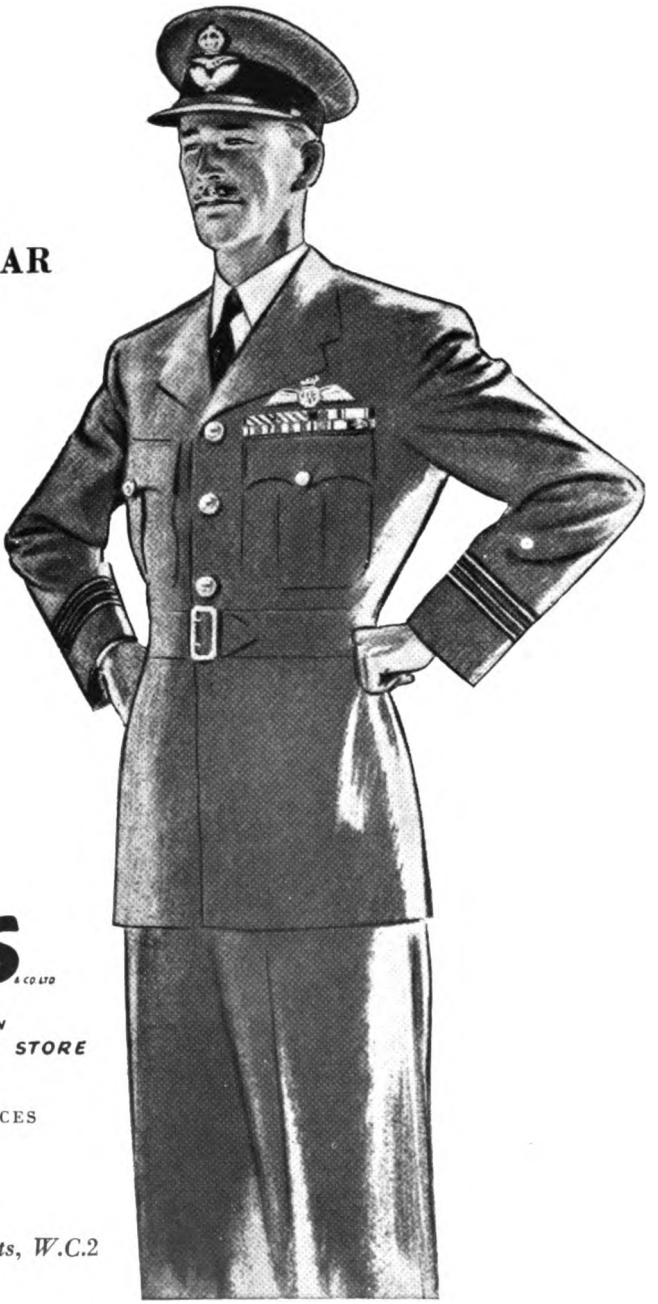

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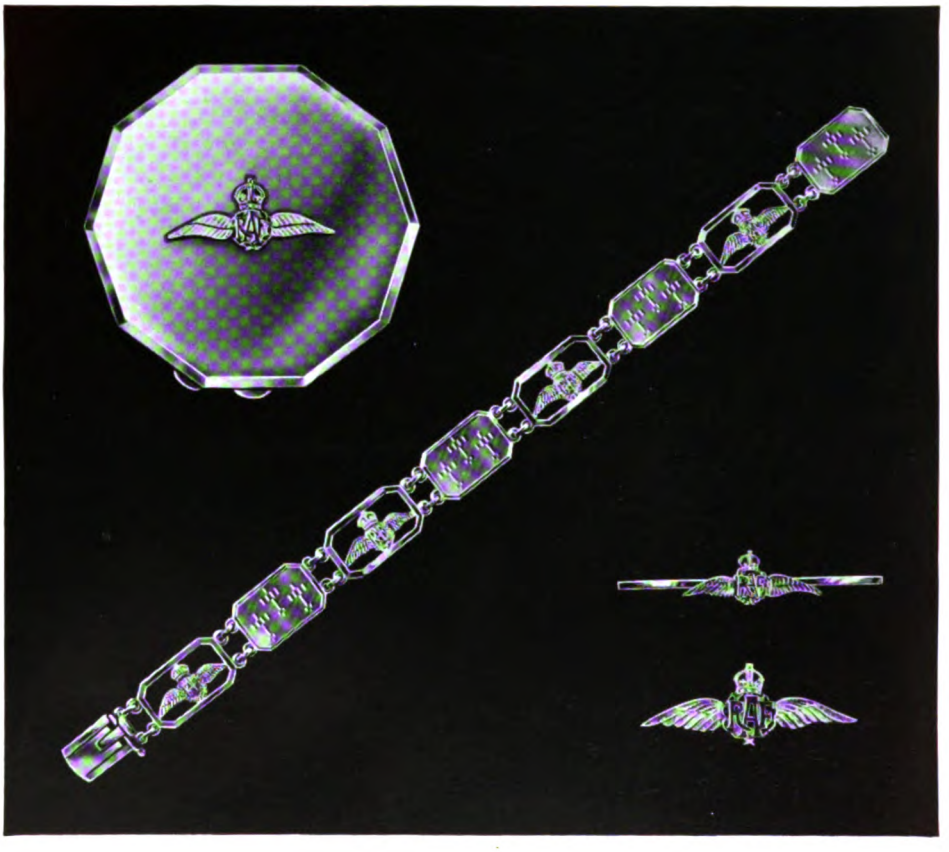

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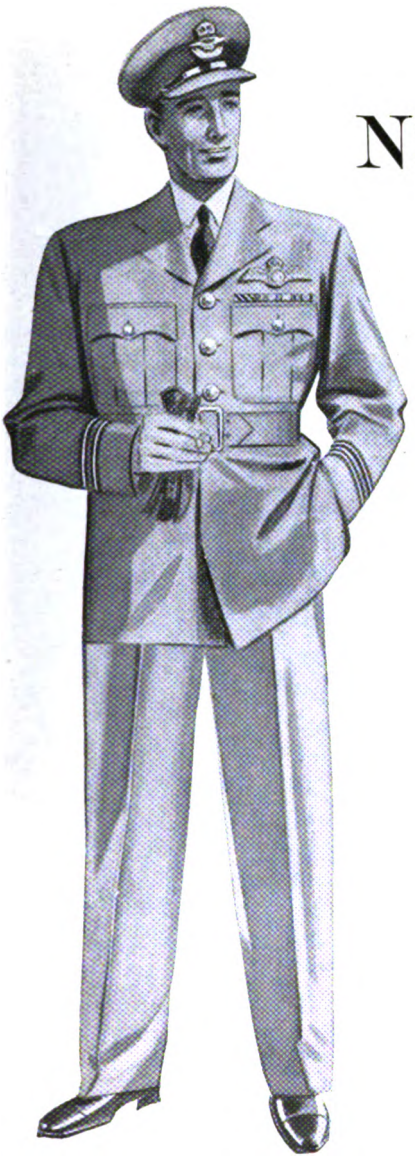

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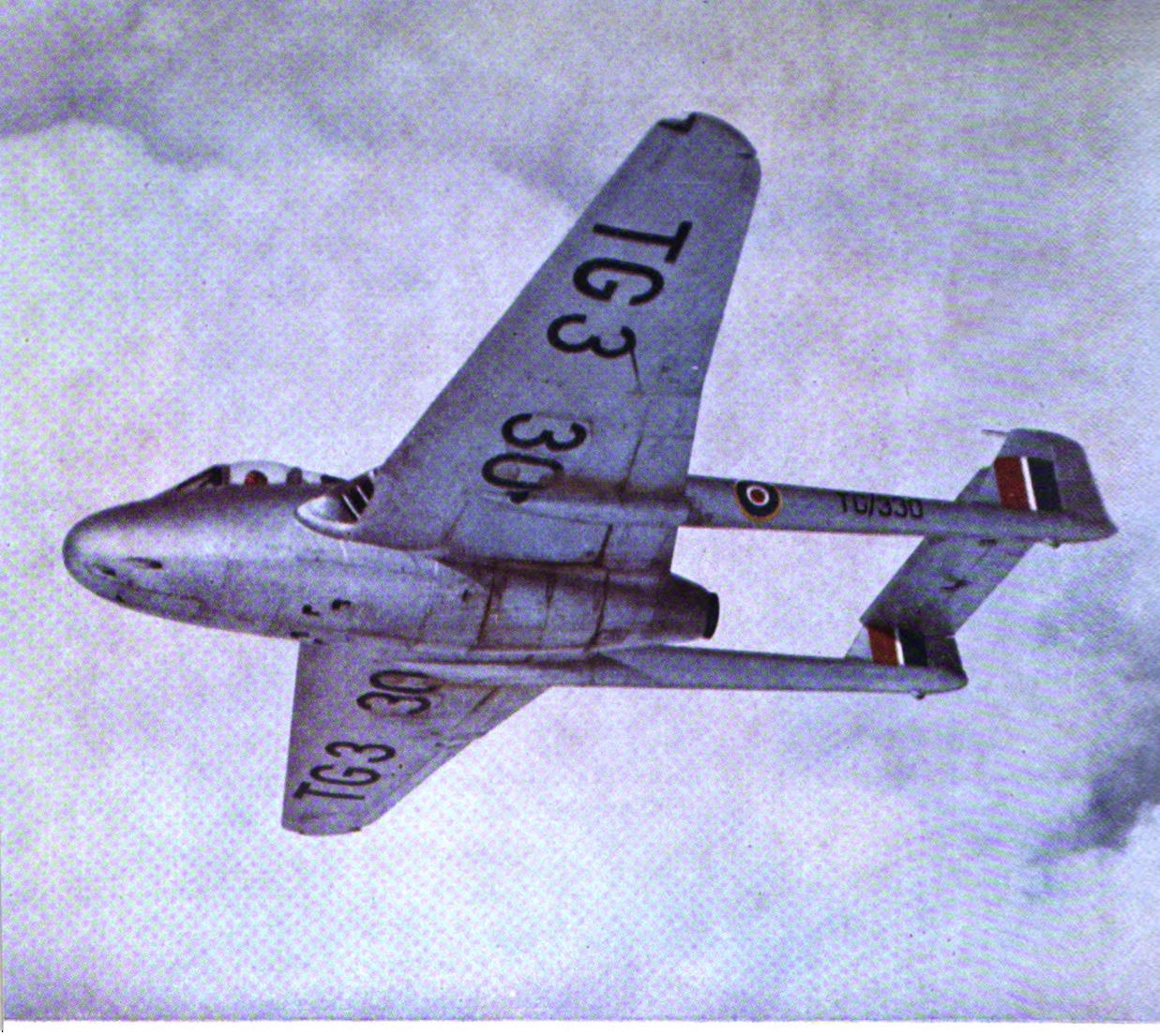

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Correspondence

To the Editor,
THE ROYAL AIR FORCE QUARTERLY.
SIR,

I have just read "Bombing and Strategy—the Fallacy of Total War," by Admiral Sir Gerald Dickens. In his preface he says that "the expression of a point of view must inevitably carry with it criticism of opinions differing from it." True; and, no doubt, he would be the first to agree that such criticism in its turn invites comment. Admiral Dickens writes with moderation and obvious sincerity of belief in the point of view which he puts forward; it is, therefore, all the more regrettable that as one progresses through the book one finds not only much to question but, also, facts quoted which are anything but "the hard facts" which, according to the dust-covers, support his arguments.

For example, on page 58, it is stated that "things at once began to improve" in the war at sea when "as a result of the Casablanca Conference in January, 1942, Coastal Command was placed under the operational direction of the Naval Staff and the destruction of U-boats by British and U.S. ships and air forces was made the first charge on their resources." In point of fact (*a*) the Casablanca Conference took place in January, 1943, while (*b*) Coastal Command passed under the operational control of the Admiralty in 1941. It is permissible at least to doubt whether the operational control nominally exercised by the Admiralty was any advance on the system which it replaced. It certainly in its initial stages endangered that good will by which alone (whatever the nominal system of control) two great Services can work effectively together. The Air Ministry and Admiralty have agreed since the war ended that proper co-operation is the only way to exercise what the great sailor, Admiral of the Fleet Sir Dudley Pound acknowledged quite early in the war was a responsibility, not of the Admiralty as Admiral Dickens says, but of the Navy and Air Force together—the control of sea communications.

But there are other and more serious errors of detail, even on maritime subjects. For instance, on page 59 it is stated that in March, 1942, there were 412 U-boats "actually at sea." The truth is that in that month the whole U-boat fleet only amounted to 288, of which less than half were operational and only 47 were at sea in the Atlantic. At the peak of the U-boat war a year later only just over 100 were at sea in the Atlantic. Such an error—of the order of 800 per cent.—cannot but raise the question of the accuracy of other statements and of the validity of deductions made from them. It may also be noted in passing that the statement on page 33 that in the Battle of the Atlantic "nearly half" the U-boats sunk were sunk by aircraft, again does not accord with the facts—actually of the U-boats in commission lost from known causes (and excluding accidents) about four-sevenths were destroyed by aircraft, including by air-laid mines. Aircraft lent by Bomber Command in May, 1942 (page 58) were never fitted with Leigh lights; and while they gave yeoman and most welcome service, the effect of their attachment to Coastal Command, as inferred in this paragraph, is, to say the least, exaggerated.

One could multiply examples: those quoted will be sufficient to indicate that the foundations upon which the argument of this book is raised are far from sure. The book is dedicated to the Imperial Defence College. Perhaps the first lesson which the student, drawing it from the Library, may learn with real profit is that it is a good thing to make sure of one's facts before committing oneself irretrievably to paper.

It is, however, not only on questions of fact that one feels compelled to join issue: matters of major policy discussed throughout the book are equally questionable. As one who has served in Coastal Command both during the last war and between the two wars, it strikes me as scarcely consonant with the furtherance of good inter-Service relations to raise the spectre of Coastal Command as part of the Navy—a particularly hollow ghost after all the two Services have been through together in the past eight years. Nor does the cry of the inhumanity of bombing as compared with the kindness of starvation by naval blockade grow any more convincing with the passing of the years.

These are, perhaps, relatively minor points. It would take too much space to deal with all the fallacies in this little book. Apparently, Groves, Severskey and Douhet are the gods at whose altars Air Staff worship—and worship enthusiastically (no one can put forward a word in favour of air power without becoming an enthusiast which by implication contains an element of the unthinking if not of the irresponsible). At least it is salutary to be told our sources of inspiration! Once again we have the assertion that new weapons do not alter principles—which is at least arguable in an age of atomic and biological warfare. And, of course, there is the underlying implication running like a thread throughout the argument that it was only the Air Staff who refused to co-operate in training (page 58), in the development of armaments (page 58) and in the

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allocation of more resources to the anti-submarine war, ignoring the facts that the first two were at least as much an Admiralty responsibility while, so far as the last is concerned, had the Admiralty built the number of escort vessels they should have built at the expense of some of the battleships and carriers that never smelt gunpowder, the need for more aircraft would have been less urgent.

The truth of the matter was that the Admiralty before the war underestimated the potentiality of the U-boat and over-rated that of radio, and left it to the war-time Admiralty, Air Ministry and Coastal Command to find a solution to this intractable problem amid all the difficulties of war.

But, of all the points which might be made, two stand out. First, it must be remembered that for the first three years of the war the Allies were on the strategic defensive—inevitably; and in that phase, particularly in its earlier stages, there simply was not enough of anything to go round. It is no good talking about what might have happened if we had possessed enough air forces to "make a Pearl Harbour of the Japanese Fleet base" in Indo-China, to provide a great tactical air force for the B.E.F. in 1940 or to give the Navy in 1939 a Fleet Air Arm in any way comparable to that which the U.S. Navy possessed at the beginning of their war in 1942. The answer is quite simply that if we had possessed enough aircraft to do all these things, there would not have been a war, because the Germans would never have dared to take us on. But to imply, as Admiral Dickens does, that while we were on the defensive we should have undertaken no "strategic" bombing at all is to ignore the military, political and psychological realities as they existed after the fall of France. Effective strategic bombing (which Admiral Dickens himself does not suggest should never have been done) was only possible in 1943 onwards because of the tactical and technical lessons and developments resulting from the admittedly far less profitable operations of the earlier years. But, apart from that, no one in the circumstances could have stood—and the Chiefs of Staff and War Cabinet of the day did not stand—for a situation in which the only arm with which we could bring any direct impact, however slight, to bear on the enemy either remained inactive or was broken up and its components devoted entirely to the interests of our own security.

Secondly, no one would suggest that the Bomber Offensive was always wisely directed or that the objectives selected for attack were always the right ones—some obviously were not. But one result of it was decisive over the whole field of war activity. It was this continuous, relentless, unseen campaign, starting in a small way in 1940 and working up to its crescendo in 1944, that created that degree of air dominance —not just superiority but supremacy—that alone made possible the great achievements of the other Services in their own spheres. The air war, as the Germans themselves said, was "fought out over their own living space," not over ours or over the land and sea battlefields. Admiral Dickens makes the astounding assertion that this result of the Bomber Offensive "was an afterthought and not due to planned strategy." On the contrary, it was the core of the Air Staff's strategic doctrine and had been ever since the R.A.F. existed as a Service. Our Air Force Commanders in the late war had been brought up from their earliest youth, by Lord Trenchard and others, to the principle that close defence, fighters and A.A. guns, could never afford complete protection but that the only sound form of defence in the air was one based primarily on the counter-offensive—carrying the war to the enemy, forcing him on the defensive, forcing him to waste man-power and material on A.A. and passive defence, forcing him to build and man fighters to protect himself instead of bombers to hit us. This is exactly what happened—even in the first three years of the war, and increasingly as time went on. From Alamein onwards the Luftwaffe was never more than a nuisance to us, while the enemy was forced to devote in vain an ever-increasing proportion of his total war effort to air defence—far more, I feel sure, than the mere 7 per cent. of the British war effort devoted to the Bomber Offensive. And the time came when Hitler had to refuse a request by Doenitz for more personnel and aircraft to support the U-boat offensive on the grounds that "I have not got the personnel. The A.A. and night fighter forces must be increased in order to protect the German cities."

The influence of a book is beyond the power of the author to control. Surely, then, the reader, especially if he be a student, has the right to expect that the facts quoted in it are accurate and that when a policy is criticised, that policy is fully understood together with, as in this case, the many military, political, moral and economic factors that condition it.

Yours faithfully,

AIR VICE-MARSHAL G. B. A. BAKER,
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PITMAN

"Jenkins, my hat and coat!"

In the sketch of this title published on pages xv and xvii of the January number, Jenkins—Wing Commander E. B. Beauman—was erroneously shown as the "late." He is very much alive and as active as ever, being actively concerned with the R.A.F. Mountaineering Association, of which we give particulars below.

R.A.F. Mountaineering Association

Since the suggestion to form a Royal Air Force Mountaineering Association was first mooted a few months ago, several mountaineers of great experience have expressed their interest in the proposal and the Association has now been fairly launched. The Chairman is Wing Commander A. J. M. Smyth, O.B.E., D.F.C., who, during the war, commanded the Air Crew Mountain Centre, Kashmir, which did fine work in making fit again operational aircrews. Wing Commander Smyth has not only been to the Himalayas but has also climbed in Switzerland and in this country.

As deputy chairman the Association has Wing Commander E. B. Beauman, a retired officer of the R.A.F. now employed at the Air Ministry. He took part in two famous mountaineering expeditions—the Kamet Expedition of 1931 and the Mount Mystery Expedition in British Columbia, in 1934—and was at one time president of the Alpine Ski Club.

The secretary, Squadron Leader P. Caddy, of Bomber Command, has made several small expeditions to the Himalayas and has also climbed a good deal on the Continent and on British mountains.

Membership of the Association is open to former as well as serving officers and airmen, and previous experience is not necessary, one of the Association's objects being to train members from the earliest stages to the highest level. The first climbing meet will be held in North Wales in the early spring and opportunity will be taken then of selecting suitable members to act as instructors. Later in the year it is hoped to hold a meet on the Continent, and as time goes on even more ambitious plans may be developed.

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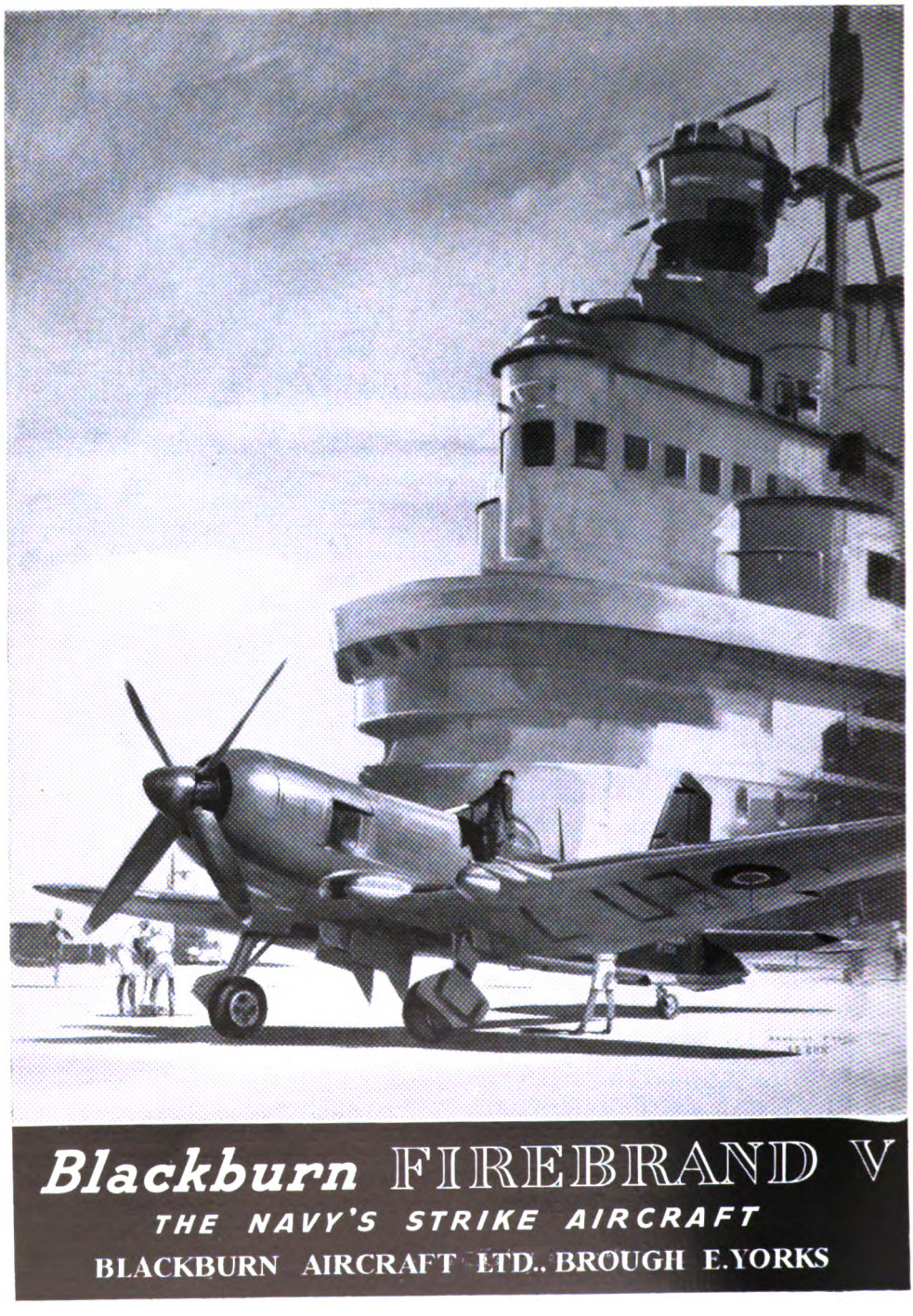

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OBITUARY

Air-Marshal Sir A. Coningham

(Photo opposite page 65)

AIR-MARSHAL SIR ARTHUR CONINGHAM, K.C.B., K.B.E., D.S.O., M.C., D.F.C., A.F.C., who was a passenger in the Tudor IV aircraft lost on a flight from the Azores to Bermuda on 30th January, was one of the outstanding air commanders of the 1939-45 war.

Arthur Coningham was born at Brisbane, Queensland, Australia, in 1895, and educated at Wellington College, New Zealand, and at New Zealand University. He liked to be known as a New Zealander, and was proud of his nickname, "Maori," which gradually became corrupted to "Mary." Two days after the outbreak of war in 1914 he enlisted in the Canterbury Mounted Rifles, but in 1916, after service in the Middle East, he was invalided out of the Army. Regaining his health six months later he travelled to England at his own expense to join the Royal Flying Corps, with which he served with great distinction in France, winning the D.S.O., M.C. and D.F.C. as a fighter pilot. In 1919 he was granted a permanent commission in the R.A.F. with the rank of Flight Lieutenant. In 1925 he commanded a flight of three D.H. 9A aircraft which made the first long-distance flight from Cairo to Kano, in Nigeria, paving the way for an air route across Africa. He was awarded the A.F.C. in the New Year Honours List of 1926. After a variety of duties at home and oversea, including wide experience in the Middle East, Wing Commander Coningham was posted to Coastal Area (forerunner of Coastal Command) in 1935, and early in 1937 became Senior Air Staff Officer of No. 17 Group at Lee-on-Solent. Shortly before the outbreak of hostilities in 1939 he was given command of No. 4 Group and was promoted air commodore.

His transfer in July, 1941, to the Middle East, where he commanded a group, led to his long and distinguished association with Tedder. Three months after reaching North Africa he was put in command of the Air Forces in Libya, later famous as the Desert Air Force. In November, 1942, Air Vice-Marshal Coningham received the K.C.B. in recognition of his services in the Battle of Egypt. When Sir Arthur (now Lord) Tedder became C.-in-C. of the Allied Air Forces in the Mediterranean in February, 1943, Coningham was entrusted with the task of concerting the air operation in support of the British First and Eighth Armies on the Tunisian battlefield, and a month later was promoted to the acting rank of air marshal. In July of that year he was put in command of the North-West Africa Tactical Air Force, which included both British and American squadrons. A month later President Roosevelt conferred on him the Legion of Merit (Chief Commander) in recognition of his valuable war services. Coningham continued to command the Tactical Air Forces in the field in Sicily and Italy, working closely with Alexander and Montgomery, until recalled to England in preparation for the assault on Europe. Early in 1944 he was appointed A.O.C. of the R.A.F. Second Tactical Air Force, which operated with the British and Canadian Armies throughout the advance from Normandy to Germany.

After the war Air-Marshal Coningham became A.O.C.-in-C., Flying Training Command, and in 1946 he was made a K.B.E. In April, 1946, he received the freedom of the city of Brussels and an avenue was named after him. Last August he resigned from the R.A.F. at his own request.

Marshal of the Royal Air Force Lord Tedder writes:

It was a grand Air Force team we had in Middle East in the difficult days: a team led by a handful of individuals, outstanding alike in their vision, courage, and initiative, but each with his own strong individual personality. And now three of that little band have gone when one would have thought they still had much to contribute. "Maori" (or "Mary") Coningham from New Zealand; Peter Drummond from Australia, who as Deputy C.-in-C. in Middle East bore so much of the burden and took so little of the credit—lost *en route* to America; Graham Dawson, from England, who as chief Maintenance and Supply officer built up an aircraft industry in the slums of Cairo and in the quarries of the Pharoahs, made bricks without straw and aircraft from scrap—lost in bad weather over France on his way back from Middle East. The only consolation about "Mary" Coningham is that he had completed his war job, magnificently and triumphantly.

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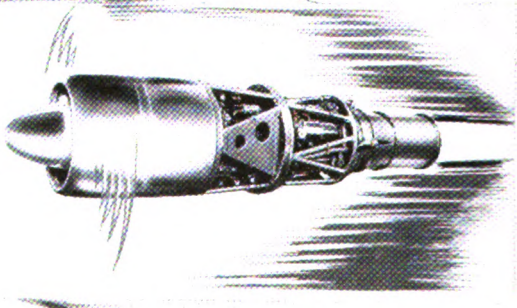

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Coningham was "the airman" personified. He had the alert, active, inquiring mind, the imaginative, highly strung temperament, the perennial youth which have characterized not a few of those who have served their country in the air. It may be that the air endows with these qualities men and women who give their lives to its service, but Coningham was the airman born and bred. It was these qualities, developed and enhanced by the wide and varied experience he gained during his service, that made Coningham the great air commander he proved to be in the late war. A brilliant record as a fighter pilot in the Kaiser's war, leader of the pioneering flight across Central Africa which laid the trail for the Takoradi route which fifteen years later was to become a life-line for the Western Desert service in Middle East where air control was proving itself as an economical and life-saving way of maintaining the peace, service with Coastal Command, command of a Group in Bomber Command in the early years of the last war—here were laid the foundations of that breadth of knowledge and understanding of operations on land, at sea, and in the air so essential in an air commander and so effectively applied by Coningham to the varying problems posed by the Desert War, the assault across the Mediterranean, "Overlord," and the advance across Western Europe.

Coningham was a brilliant commander of air forces. War, to him, was an art rather than a science; insistent though he was on administrative and technical efficiency, he always put morale first and material second, quality before quantity. His weapon was the rapier not the bludgeon. His greatest contribution towards victory however—and its value is quite incalculable—was in the lead he gave to the idea of the land-air team. It was to him personally more than to anyone else that we owe the initiation and development of the joint land-air technique which became the doctrine and practice of the Eighth Army and the Desert Air Force and subsequently of the Allied Armies and Tactical Air Forces in North Africa and Europe. To quote his own words, spoken at Tripoli in February, 1943: "The soldier commands the land forces, the airman commands the air forces; both commanders work together and operate their respective forces in accordance with a combined army-air plan." At times a candid critic, but at all times a loyal colleague of his army team-mates, he, more than any other man, fulfilled the wish expressed by Mr. Churchill in a message to the R.A.F., Middle East, in July, 1942: "We are sure you will be to our glorious Army the friend that endureth to the end." Coningham was that friend.

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AN OUTSTANDING COMMANDER AND TACTICIAN

The Late Air-Marshal Sir Arthur Coningham,
K.C.B., K.B.E., D.S.O., M.C., D.F.C., A.F.C.

(An obituary notice appears on pages xv and xvii)

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The Future Development and Defence of the Empire

By Wing Commander A. S. Judson, D.F.C.

'Man's progress through the ages is from a régime of domination to one of understanding, consent and free co-operation."—Field-Marshal Smuts, at St. Andrews, 17th October, 1934.

IN these days of uneasy peace, when the world is agitated by a swiftly changing flux of ideas, emotions and events, seemingly without pattern or purpose, grasp of essentials is easily lost. Efforts to stabilize in the mind the continually shifting picture presented by press and radio are apt to result in a state of chronic perplexity. It is most necessary, therefore, if policies are to be rightly guided and action to be decisive, to seek for constants, to dig through the sand of circumstance to the rock of principle. It is accordingly proposed, in considering this vital matter of the future of the British Commonwealth and Empire, to avoid arguing evanescent issues and to try instead to weave a pattern of constructive thought on fundamentals. If the political, economic and defence structure of the British Commonwealth and Empire is weakening, as many maintain, the first essential task is to examine the foundations of the structure and see whether they require to be underpinned. This is not at first sight an easy thing to do.

The British Empire, to give it a short title, has a quality which seems to elude the understanding. Many who have tried to explain what it is, why it exists and how it has continued to survive, or who have attempted to decide upon its future, have been baffled by its apparent formlessness and inconsistency. Definitions, policies and plans tend to take on a character of unreality almost as soon as they have been formulated. The Inter-Imperial Relations Committee of 1926, which was expected to clarify the constitutional structure, did not help in any great degree. The report describes the peoples of the British Empire as "autonomous communities . . . equal in status, in no way subordinate to one another in any aspect of their domestic or external affairs, though united by a common allegiance to the Crown, and freely associated as members of the British Commonwealth of Nations."

It was admitted in the report that a foreigner might be tempted to think that this formula "was devised rather to make mutual interference impossible than to make mutual co-operation easy," and some looked upon it as an obituary notice. Yet since then the Empire has successfully fought and survived a world war, the second in the space of a single generation and the most severe and widespread in the history of humanity. Not only did the peoples of the Empire "mutually co-operate" with outstanding singleness of purpose, but a wholehearted co-operation was achieved with the U.S.A. and many other peoples. Gradually, as time went on, more and more powerful forces were marshalled to co-operate against Germany, Italy and Japan, until their resistance was beaten down and their very considerable forces overwhelmed. The Axis Powers had more time to prepare for this war than was given to the Allies and, when it opened, they appeared to command forces of overpowering strength; but the tide turned against them and in the end they were utterly defeated. Before considering the future, it might be worth while to seek some explanation for this strange current of circumstance. It was not a freak of chance.

The Organic Power of Freedom

The characteristic which has won for mankind survival and the dominating place on earth is not superior force, but superior skill in turning forces greater than his own to his own advantage, the forces available being co-ordinated manpower or "teampower" and harnessed natural energy. Both may be converted to machine-power to achieve a certain degree of concentration and precision in operation. This observation applies as much to the struggles of men among themselves as to the struggle for existence of the human race as a whole. The man, family, community, nation or group of nations that has the greatest capacity to direct the forces of human "teampower" and of nature is most certain of survival and success in the human conflict. There is, of course, more to it. Sufficient resources of energy and material, both human and natural, are needed in addition, but possession of directing skill, of organizing power in its highest sense, is the prime essential. Through the exercise of organizing power the necessary resources of energy and material can be acquired as the need arises.

Organizing does not consist only in having everything "cut and dried," an expression which connotes death. It lies rather in the ability to

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confer purpose and order and to make alive. The Concise Oxford Dictionary gives one meaning of organize as "to make organic, make into living being." It is perhaps in the interpretation of organizing as skill in directing a living evolution that the key to the British genius may be found. A respect for the natural order of the world is implied, an understanding that the characteristic of adaptability to change should be preserved and that natural forces should be allowed free play. "Free" is the important word. Quoting once more from the report of the Inter-Imperial Relations Committee, "the British Empire is not founded upon negations. It depends essentially, if not formally, on positive ideals. Free institutions are its life blood. Free co-operation is its instrument." The British insistence that freedom is the essential atmosphere for successful organization and survival largely explains possibly why the British Empire has for so long been a vital and powerful entity in the world, while one by one other empires have disintegrated. There would seem to be some virtue in a belief in freedom which imparts to those who hold it, individually and collectively, a resilience and toughness that is above the average.

It is the conceit of many so-called advanced thinkers in these days that they can learn nothing from the past, particularly from more distant times. Such unwarranted pride takes no account of ancient ideas buried in the deeper layers of the human consciousness. The idea of freedom is of this kind, of ancient origin. The Arbroath Manifesto, sent by the followers of Robert the Bruce to the Pope in 1320, concludes with the words: *"We fight not for glory, nor for wealth, nor for honour, but for that freedom which no good man will surrender but with his life."* These words might have been written in 1940. They were certainly paraphrased on many occasions in that momentous year.

We must be clear in our minds, however, what freedom means. The traditional British belief is that the exercise of personal initiative and resourcefulness and the unrestricted operation of the creative impulse will on the whole be productive of good results. We have found it best to trust our fellow men, to give them credit for good motives and, unless we have definite evidence of malice, to allow them to live freely in the manner they choose. That the limited understanding of some of our self-styled advanced thinkers fails to reveal to them any logical reason for the soundness of this belief, does not prove that it is wrong. It is indeed, perhaps, more an article of faith than a demonstrated scientific truth, but it has served us well.

Some, not without power in the councils of the Empire, appear inclined to believe that freedom means anarchy. Others proclaim the dangerous paradox that the possession of freedom must entail a loss of liberty. Our heritage of political wisdom, of which as a people we should be proud above all else, points a reasonable path between these far from recent heresies. Hooker, one of the earliest of our great political philosophers, captured the true spirit of freedom, and, in fact, forecast the basic political character of the Empire in these words: *"Two foundations there are which bear up public societies; the one a natural inclination whereby all men desire sociable life and fellowship; the other an order, expressly or secretly agreed upon, touching the manner of their union in living together. The latter is that which we call the law of a commonweal . . ."**

If the free character of the political institutions in Great Britain, the Colonial Empire and the Dominions is not preserved, we shall almost certainly lose our friends and allies; for it is largely the attraction of the idea of freedom that has gathered round us the superior forces with whose aid we have overthrown our enemies. It has even won our enemies to fight on our behalf. There are many examples of this, the most outstanding being that of the Boers, whom we fought in 1902 and who fought with us in 1914. Moreover, it is *"that freedom which no good man will surrender but with his life"* which the peoples of the Empire themselves fight to defend. If it is denied to them, they will in all probability fight among themselves to restore it and not only leave the way open for an acquisitive peacemaker to come in and deprive them of it altogether, but also very likely sever the ties which bind them to the Empire. There has already been one lapse of this kind in our history, which is perhaps worth calling to mind.

In 1783, after eight years of war, Great Britain signed away the American colonies at the Treaty of Versailles. In 1775, a year before the Declaration of Independence, Burke, who had vigorously opposed the measures which led to the rebellion, spoke these words in the House of Commons: *"As long as you have the wisdom to keep the sovereign authority of this country as the sanctuary of liberty . . . wherever the sons of England worship freedom, they will turn their faces towards you. The more they multiply, the more friends you will have; the more ardently they love liberty, the more perfect will be their obedience. Slavery they can have anywhere. It is a weed that grows on every soil."* Then, after enlarging further on freedom, which, he said,

* "Ecclesiastical Polity." Book I, Section 10. 1592.

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"infused through the mighty mass, pervades, feeds, unites, invigorates, vivifies every part of the Empire, even down to the minutest member," he added, *"All this, I know well enough, will sound wild and chimerical to the profane herd of those vulgar and mechanical politicians, who have no place among us; a sort of people who think that nothing exists but what is gross and material; and who, therefore, far from being qualified to be directors of the great movement of empire, are not fit to turn a wheel of the machine. But to men truly initiated and rightly taught, these ruling and master principles, which in the opinion of such men as I have mentioned, have no substantial existence, are in truth everything and all in all. Magnanimity in politics is not seldom the truest wisdom; and a great empire and little minds go ill together."* Burke's warning went unregarded, however, and in the words of Thomas Buckle *"rash and ignorant men . . . soon brought the greatest disasters upon the country and within a few years actually dismembered the empire."*•

The Menace to Freedom and World Peace

So much for the idea of freedom, which, properly interpreted, should be our guiding political principle in the defence of the Empire. It has been examined at some length because many think that the first campaigns on the political front in the third world war have already opened; forces have been engaged in battle for some time. The enemy is Russia. The fourteen men in the Kremlin have great skill in turning the forces of discontent and ancient hatreds to their own advantage and are continually improving the technique. Advancing with cynical subtlety under a smokescreen of lying jargon about freedom, designed to bewilder the feebleminded, Russia has already occupied the eastern half of Europe and has shown abundant evidence of further aggressive intentions.

It is particularly illuminating to compare the statement of the Russian clerk, Gouzenko, made in Canada in October, 1945, with the manifesto drawn up by the Cominform at the Warsaw Conference in October, 1947. Gouzenko said that the dissolution of the Comintern was a deception and that *"the Soviet leaders have never relinquished the idea of establishing a communist dictatorship throughout the world."* Since then Russia has not only sponsored the formation of the Cominform, but in the attitude she has taken up both in and out of the United Nations Organization has clearly shown her intransigent hostility to the free democracies of the world. The Warsaw Manifesto is a plain declaration of political world war. The two opposing camps are described, that of the U.S.S.R. and the "democratic" countries having a policy *"aimed at the disruption of imperialism and the consolidation of democracy,"* and that of the U.S.A. and Great Britain having a policy *"aimed at strengthening imperialism and strangling democracy."* It is stated that *"the tactical methods used by the imperialistic camp are most varied; we find a combination of threats of force, blackmail, extortion, various political and economic pressures, and the utilization of internal strife for strengthening its position."* It is claimed that *"there is a great task awaiting the Communist parties, that of preserving freedom and peace."*

Gouzenko's statement suggests a deliberately deceiving character in these vociferations. He said that *"the Communists are engendering hatred in the Russian people towards everything foreign"* and that *"the Communist party in democratic countries has changed long ago from a political party into an agency net of the Soviet Government, into a fifth column in these countries to meet a war, into an instrument in the hands of the Soviet Government for creating artificial unrest, provocation . . ."* It seems that the fourteen men might have profited from a study of Nazi propaganda methods, especially their trick of imputing to others their own methods and motives. Already it is evident that Russia is using U.N.O. as a stalking horse in the same fashion that Germany, Italy and Japan used the League of Nations; and it will probably not be long before she protests that she is encircled by the U.S.A. and the British Empire, as indeed she is geographically.

As well as revealing the dangers of Russian political aggression, Gouzenko's statement confirms that our first principle in defence against it should be to preserve the freedom of our institutions, that we should not be tempted to abrogate freedom for the sake of a supposed increase in efficiency and that the traditional British idea of freedom should be preserved from malicious distortion, both within the Empire and in other countries, if that is possible. Gouzenko stated that:

"The Government of the Soviet Union asserts that the Russian people have, as it were, their own particular understanding of freedom and democracy, different from that which prevails among the peoples of the western democracies. This is a lie. The Russian people have the same understanding of freedom as all the peoples of the world. However, the Russian people cannot

• "The History of Civilisation in England." Chapter VII. 1857.

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realize their dream of freedom and a democratic government on account of cruel terror and persecution."

We know that the peoples whom the Russians have already "liberated" are now in the same position of having been deceived by the Russian lie. If, by example and propaganda, we can expose this lie, we may well succeed in frustrating the Russian plans. It is significant that Gouzenko stated that he himself was inspired to turn against his taskmasters and make his revelations by an appreciation of what freedom meant in Canada.

There is no doubt that, at least in the political field, Russia is a first-class enemy, whose skill and persistence we cannot afford to belittle. To what extent the Communist party is active as a fifth column in the Empire cannot be accurately estimated. In Canada, after the publication of the findings of the Royal Commission set up as a result of Gouzenko's statement, the Communist party was outlawed, but in the other Dominions, Great Britain and the Colonies it is still openly at work. It is highly desirable that Canada's lead should be followed and that, throughout the Empire, the Communist party should be exposed and declared illegal. Russia and her satellites would protest, but there is nothing to be gained by attempting to appease her. "Magnanimity in politics" does not require the eyes to be closed to evidence of treachery and malice.

The Counter to Communism

However, to expose communism and mobilize public feeling against communists would demand wise and experienced, or at least well-instructed, political organization and leadership. Neither in Great Britain nor the Empire will the majority of the people, especially those who have already come under the influence of Russian propaganda, readily credit the existence of a Russian bogey in their midst. There has been talk of forming a "Socinform" to co-ordinate resistance to communism and spread socialist doctrine, but it is undesirable that the battle on the political front should be regarded as purely forensic. The Communist party is intelligently organized and could take advantage of such a move without great difficulty, most probably by supporting it. The formation of a "Socinform" would merely add more smoke to Russia's smokescreen and make confusion worse confounded, for the Communist's main weapon is not political doctrine but political *action*. Lenin continually emphasized the need for combining "sober, scientific analysis of the objective state of affairs" with "energetic revolutionary activity." **We would do better to use our energies in countering communist action than in attacking communist beliefs.**

The basis of the Russian plan, which the Communists are endeavouring to implement, appears to be to promote economic distress. The Warsaw Manifesto refers with obvious satisfaction to "the intensification of the general crisis of capitalism"; the Marshall Plan is described as "the plan for the economic and political enslavement of Europe." The Russian "analysis of the objective state of affairs" is that economic distress will strengthen the following of the Communist party, which represents itself as the "vanguard of the working class" leading them on to "freedom and peace." The role of the party is to take every opportunity to dislocate the capitalist and, for that matter, the socialist economic system by "revolutionary activity." The ultimate though undisclosed aim is the destruction of the potential for armed resistance to Russia by the disruption of production. The fourteen men in the Kremlin can claim with truth that they want peace; **they want a war no more than Hitler did, if they can get their way without it.**

Our only sure defence against this form of underground economic warfare is to promote prosperity in spite of it. But we must not rush blindly into action. We too must make a sober, scientific analysis of the objective state of affairs, not omitting to take into account the forces of human goodwill and enthusiasm, of the desire to compete and excel, of the natural appetite for pleasure, and, most important of all, of human hopes and dreams. These potent forces, if properly mobilized, directed and co-ordinated, can act very strongly for the mutual advantage of members of a "commonweal." Not all men are in the grip of the seven deadly sins. We must beware of accepting too readily the gloomy view of H. G. Wells "that civilized man is a very imperfectly domesticated aggressive animal; that in each generation he has to be broken in again to social life."* Traditions of honesty and unselfishness are not to be despised. We must beware too of falling into the error of reckoning human appetite in terms of calories and manpower in terms of numbers of men. The application of scientific methods should be tempered with humility of approach and common sense and we should not forget that **economics in its strict sense is the "practical science of the production and distribution of wealth."**

As well as "scientific analysis," "energetic action" is required, for there is no easy way to promote a prosperity in which even the potential Communist can share. The first essential is

* "The Work, Wealth and Happiness of Mankind"

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teamwork, a co-operation in creative effort that will transcend the present paralysing alliances of the weak against the strong and of the ignorant against the properly taught. By co-operation—between labour and management; between the various elements of industry and commerce; between Great Britain, the Colonial Empire and the Dominions; and between the Empire as a whole, the U.S.A., and the countries of Western Europe—great advances could be made in the present average standard of living. It should be made known that Russia, through her net of economic saboteurs, is stirring up class war in her own interest and that it will be in the interest of all free peoples to combine to ward this danger off. Labour conditions, the supply of raw materials, production programmes, transportation and distribution, prices and economic affairs generally should be organized—not regulated or controlled—by formal or informal agreement, with the sole object of increasing the general level of prosperity. Competition should be encouraged, but only in so far as it has a stimulating selective effect. There should be "an order, expressly or secretly agreed upon, touching the manner of our union in living together," extending to any nations who might have the "natural inclination" to associate themselves with it. If we should succeed in organizing such a movement and if, by combined economic development on a grand scale, the comfort, pleasure and convenience of life in the free countries were to be increased to a level of which no man could complain, the Communist fifth column would lose most of its influence and a great danger to the Empire would be removed. **In the economic war, therefore, our guiding principle should be co-operation to promote prosperity.**

Importance of Economic Co-operation for Defence

Economic co-operation within the Empire is of vital importance not only for defence against Russian "revolutionary aggression," but also for its defence against the possibility of aggression of the more conventional kind. The better we are prepared to meet such a possibility, the less likely it is to occur, and the first need in modern war is adequate industrial backing. But more is required than the establishment of an Imperial Customs Union. There must be organized central and regional economic collaboration. Satisfactory methods of co-operation between the nations of the Empire were evolved during the war and all that is required is for the process of evolution to be continued. However, the process might well be accelerated. Any form of central controlling machinery in the Empire has quite rightly always been rejected by the Dominion Governments as inconsistent with the principles of Dominion autonomy. Yet the Dominions have all expressed the desire to co-operate and it would seem desirable, therefore, that there should be some permanent means of organizing this inclination. Bearing in mind that evolution is impossible unless the characteristic of adaptability to change is preserved, such an organization might take the form of a Commonwealth and Empire Secretariat, having as one of its functions the fostering of a combined study of economic problems and policies of mutual interest. Dr. Evatt, the Australian Minister for External Affairs, has recently suggested that there should be some such arrangement. It would have great value for fact-finding and for progressing the decisions of Imperial Conferences, for which it would undertake secretarial duties.

At the present time the weak point in the Empire economic front is Great Britain. The Dominions are rallying round her in her economic troubles and are displaying a generosity and concern which should prove to all the world the solidarity of the Empire team, but Great Britain herself has come very near to letting the side down. Apart from a failure to grasp what is meant by organizing, the main difficulty appears to be that the people of Great Britain will not work hard enough, either because they are fatigued by the long effort of the war or, more probably, because they have been led to believe by advanced thinkers that in an up-to-date community in peace-time hard work is unnecessary. There has been a failure to realize that, **in the ultimate analysis, wealth is the product of work, both the wealth of the individual and the wealth of the nation, no matter how it may be distributed.**

That "humanity has never produced a worker type" is another Wellsian half-truth. When men realize that it is in their interest to do so, when they have the emotional satisfaction of seeing some tangible result from their labours and when the creative impulse is allowed free play, they will work as effectively as bees or ants. During the war these incentives led the British people to make prodigious efforts. In peace-time, if for the atmosphere of class war there could be substituted an atmosphere of free co-operation, it is probable that they would produce the same result, the common interest, the tangible result of work and the aim of the creative impulse being an increase in the comfort, pleasure and convenience of life. Some would demand or claim higher motives, but these would satisfy the average man.

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The need for the development in the Dominions and Colonies of food, power and raw material resources and of transportation and manufacturing industries is already fully realized. In the Colonial Empire there are many schemes in progress and projected. Agriculture, animal husbandry, forestry, fisheries, mining and secondary industries are all to be encouraged and assisted under the Colonial Development and Welfare Act. In the Dominions, especially Canada and Australia, the war stimulated a rapid development in industry and trade which shows promise of continuing. These Colonial and Dominion developments are of vital importance to the Empire as a means both of achieving a higher level of prosperity as a defence against revolutionary aggression and of providing reserves of industrial potential for purposes of defence against armed aggression.

The Problem of Secure Bases

In war Great Britain has hitherto been the principal base of the Empire, but it seems probable that in the future her people and her industries, ports and internal communications will prove to be excessively vulnerable to bombardment. More secure bases, capable of replacing the function of Great Britain, will therefore be required, and to provide them will be a major undertaking. In considering what is involved, a lecture given to the Royal United Service Institution by Lieut.-General Sir Wilfrid Lindsell in February, 1947, is of interest. He defined a base as "a very large area, a country if you like, with its harbours, railways, light and water undertakings, its whole transportation and manufacturing capacity developed, co-ordinated and directed for the service of the armed forces, but not of course to the exclusion of the meeting of essential civilian needs, however much these latter may have to be subjected from time to time to the essential needs of the fighting services."

It is evident that the task of building up a base in an area not already developed would require enterprise and organization of great scope and scale and would take a number of years, if not decades, to complete effectively. There does not appear to be any very immediate possibility that Russia will make war against the Empire and we might well have the time to undertake such a task as a long-term plan, if it were decided to make a determined effort. It is quite certain, however, that we should have little chance to complete it if nothing were done until war broke out, for there is a strong probability that a future war will start with a full-scale attempt to overwhelm resistance before it has a chance to build up. It is fortunate, therefore, that suitable base areas in the Empire have already been partially developed.

The subject of General Lindsell's lecture was the development of India as a base for military operations during World War II. It is to be hoped that the newly fledged Dominions of India and Pakistan would be willing to allow the extensive facilities that were provided for the war against Japan to be used again in the event of a war with Russia, but India might prove to be as dangerously exposed to bombardment from the north as Great Britain would be from the east. Both countries should therefore be regarded as advanced bases, as outposts in the front line. For our main base or bases we should look still further afield. Canada is a possible choice, since she has a rapidly growing industrial capacity and valuable reserves of natural resources. However, Canada may well come within range of trans-polar attack as new weapons are developed and may find herself in the position of an outpost to the U.S.A.

The most favourably placed areas in the Empire would appear to be Australasia and Africa, both of which are capable of further extensive economic development. Africa in particular is well suited as a base area, since it has the quality of "space-deepness" which the geopoliticians consider to be so important as a factor in defence. Egypt and the Middle East, which served as a base for the operations in North Africa during World War II, might be looked upon as a further section in the chain of outposts that are particularly liable to be attacked and for which complete security cannot be guaranteed. We should endeavour to retain our influence there. With regard to Australasia, Australia and New Zealand, and the colonial territories and spheres of Empire influence on the mainland of Asia and in the islands to the north, would serve respectively as bases and outposts if a front were to develop in China, as might well happen; there are already signs that Russia might attempt an armed offensive in this direction to back up the revolutionary offensive that she has been carrying on for so long in Sinkiang and Mongolia.

The Basic Needs of Security

It is frequently stated that, although we should be prepared to reinforce any threatened portion of the Empire at short notice should the need arise, we cannot be strong everywhere at once. This may be true of armed strength, but it need not necessarily be true of economic strength, and granted the latter might even cease to be true of the former. There is a possibility,

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though far off at present, that by the development of the Dominions as "production bases" the double aim might be realized of achieving prosperity and at the same time satisfying the basic needs of security. The first task to be tackled would be to organize a shift of population from Great Britain to the Dominions which are at present underpopulated, especially Australia, whose population is less than one-sixth that of Java. This would have the effect both of increasing the productive capacity of the Dominions and of solving some of Great Britain's problems by reducing the volume of imports she requires at present. There would be many difficulties in carrying out such a scheme, but by the joint fostering of attractive enterprises through a Commonwealth Secretariat these could possibly be overcome.

Another vital need is for the combined planning of improvements to sea, land and air transportation, particularly the last, for which an efficient standard ground organization is urgently required. It is self-evident that, with the world-wide dispersal of the countries of the Empire, the value of having a thriving mercantile aviation would be very great. Through a Commonwealth Secretariat, by joint financing and manning, both regionally and on the trunk routes, important advances might be made on the work already done by C.A.N.G.O. and other organizations. The final aim in the development of Empire transportation should be the establishment of an integrated network of railways, roads, air routes and shipping routes throughout the Empire and, in fact, the world, planned in relation to each other and designed to serve both commercial and strategic needs.

In determining strategic needs the foremost consideration should be the increase of air power and air potential. It was truly prophesied over sixty years ago that man's conquest of the air would bring with it a "diminished efficiency of barriers."* Nowhere in the world now is there such a thing as an impassable frontier. With the steady increase in the range, speed and carrying capacity of aircraft, even the sea frontiers between the oceans and the continents have ceased to be defensible in the traditional manner. Armies and navies are helpless and virtually harmless if pinned down by domination of the air above them, and the air has become the field for a separate battle. The balance of sea and land power, on which our conception of Empire defence has for centuries been based, has been upset by these new over-riding factors in strategy. Time and distance have taken on different values and geographic disposition has a changed significance.

The principal effects of aviation development on Empire defence have been to bring the territories of Great Britain, the Dominions and the Colonial Empire closer together in space and, even more significant from the strategic point of view, to place them in a new encircling relationship to the continental area of Eurasia. Canada, Great Britain, the Mediterranean and Middle East, India and Malay lie on an inner circle in terms of great circle distance from the mean centre of the Continent; Africa and Australasia lie on an outer circle. It is worthy of note that the inner circle could be strengthened by an alliance with China and the Arab peoples of the Middle East and that both the inner and the outer circle could be strengthened by alliance with the U.S.A. and the countries of Western Europe which have overseas possessions.

Should Russia attempt to break her bounds and go to war, it might be possible, granted adequate air striking forces of sufficient range and power, based on the inner circle and supplied from base areas in the outer circle, to bombard her from all points of the compass simultaneously. Granted air and surface defence forces of sufficient strategic mobility, it should be possible from previously prepared bases to counter an attempt to break through the inner circle at any point. India, the Middle East and Western Europe are the points of greatest danger, and China is a probable point. For such a war we should need sufficient naval strength to secure our sea communications, especially against submarines, and sufficiently numerous and mobile armies, equipped with adequate armament, to defend our advanced bases in the initial phases and to exploit air advantages in the final phases; but our first and principal need would be for power to attack and power to defend in the air, over land and over sea. Unless we have this power we shall not begin to be capable of successfully engaging in a war, however strong our navies or our armies might be.

A Commonwealth Combined Chiefs of Staff Office

How the Empire forces should be composed, armed and trained, where located and how organized and supplied, and what the zones of joint or regional responsibility should be, are questions to be decided only after the most careful joint consideration. Here there is a difficulty. At present, although Great Britain and the Dominions remain in close consultation on defence matters, there is no permanent co-ordinating organization. This might be supplied, if the

* "The Empire of the Air," by L. P. Mouillard. 1881.

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Dominions will consent to it or preferably suggest it, by a Commonwealth Combined Chiefs of Staff office, associated possibly with the proposed Commonwealth Secretariat. Continuous joint study and progressing of supply, manning, research, technical development, training and administrative methods would be invaluable for keeping long-term plans and programmes up to date. The present liaison officers, the exchange of officers among the British and Dominion services and joint attendance at the Imperial Defence College, the Joint Services Staff College and Service Staff Colleges foster the essential spirit of determination to co-operate, but continuous joint work on the detail of the actual problems of Empire Defence would give the spirit flesh and bone.

The most immediate problems to tackle jointly would be how to prepare the advanced and main bases and how to conserve and develop the potential for adequate air, land and sea forces. These are principally economic problems of finding money, manpower and machine-power and would have to be studied in conjunction with the appropriate departments of the Commonwealth Secretariat. Success in solving them would depend partly on securing a firm understanding with the U.S.A., the nations of Western Europe, the Arab peoples and China. However, we could not expect these nations to view a partnership in such an enterprise with ungrudging favour until we have overcome present economic difficulties and are reasonably prosperous. We have their friendship now, but it would be unreasonable to expect their active co-operation unless they were certain that they had nothing to lose and even something to gain of a tangible sort.

The next most immediate problems would be how to keep naval, military and air armament up to date in range, power and mobility, and how to provide adequate defence against new weapons that may be used against us. These are problems partly of research and technical development and partly of training. Research into war applications of advances in scientific knowledge should be given a high priority, but the development of new weapons and equipment and the practical proving of their value and effect in service trials and exercises are equally necessary. The temptation to discard a series of new possibilities on theoretical grounds, while the equipment in use becomes steadily more out of date, should be resisted. An essential accompaniment of progress in research should therefore be the periodical organization of combined exercises with all arms in one or other of the base areas. This would also be the most effective way of evolving efficient administrative methods.

So much for the principal problems. The list could be extended in detail almost indefinitely. The exploitation of atomic energy, the development of new oil resources and, a most interesting possibility, the mass-production of alcohol from tropical vegetation as a substitute for petroleum —to select but a few—are all of importance. Much thought and some work is being devoted to the solution of many, though not all, of them; but all will largely remain problems and not accomplishments until the Empire as a whole has sufficient money, manpower, and industrial resources to permit organizations to be created, teamwork to go forward and plant to be provided on an extensive scale. It would seem therefore that our guiding principle for armed defence should be that security will follow only from prosperity. Much can be done in a small way, but nothing can be done in a big way without wealth to spare and we may be sure that Russia, if she goes to war at all, will do so in a big way.

CONCLUSION

A point has now been reached at which our examination of the foundations of the Empire's structure has revealed a central purpose—to create prosperity. In addition an estimate has been made of the work required to preserve the structure against new threats to its stability. The need has been determined for free co-operation with the aim of producing and distributing within the Empire a maximum of wealth. If this end can be furthered through general or regional agreements, the World Trade Charter or the Marshall Plan, so much the better. If Russia will permit a positive result to be obtained through the United Nations Organization, which was formed with the ostensible object of bringing liberty, prosperity and security to the world, then our purpose will be served. But, at the same time, we should not be too sanguine. Agreements are worthless unless followed by action —on all sides. Co-operation with other states by member states of the Empire, or participation by the Empire as a whole in a wider co-operation with other nations, should be without prejudice to the implicit unity of the Empire within itself. The only sure way of securing immunity from the two-fold danger of a revolutionary aggression which may disarm us and an armed aggression which may overwhelm us is to pursue our purpose through the free but organized co-operation of the Commonwealth and Empire.

Finally, it is desired to emphasize once more that the first and basic principle is that freedom should be preserved. If the aim of creating prosperity is to be achieved, if the Empire is to

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remain united and to have the friendship and respect of other free nations and to survive and evolve in the world, it will be through the individual endeavour, the teamwork and the leadership of free men, and not otherwise. Free men are the basic components of the Empire's structure and its strength depends on them. Field-Marshal Smuts, who understands these things as well as any man, once said that "the disappearance of the sturdy, independent-minded, freedom-loving individual, and his replacement by a servile standardized mass-mentality, is the greatest human menace of our time." Since 1934, when these words were spoken at St. Andrews, this menace has shown itself in the armed aggression of Germany, Italy and Japan and, with great cost and effort, it has been removed. It is now showing itself in an even more dangerous and subtle form. It is the same weed of slavery of which Burke spoke, and we must see to it that it does not spread.

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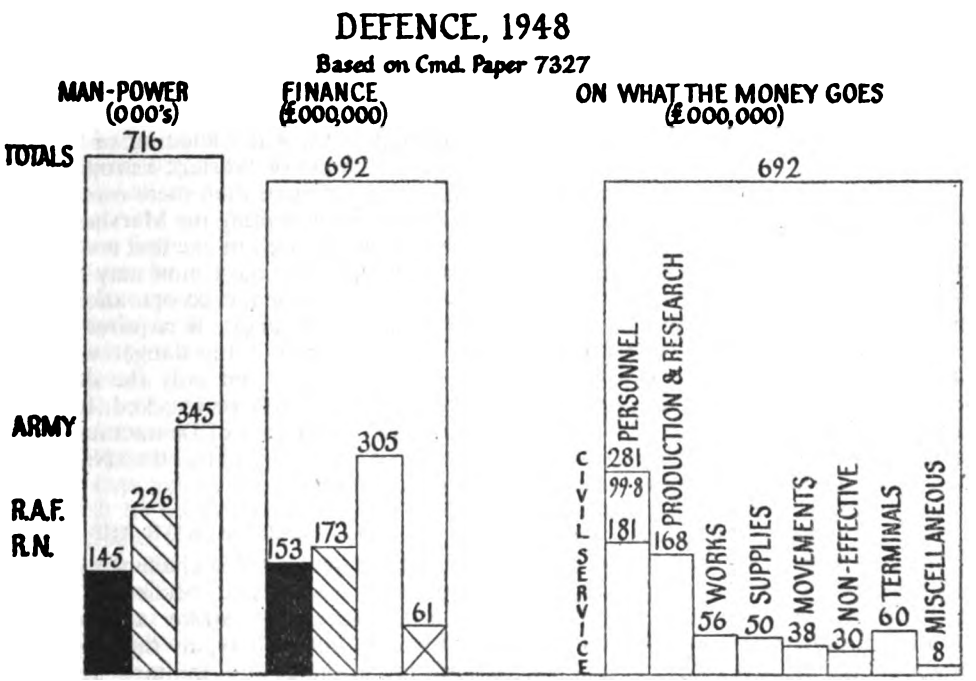

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A Union of Western Europe

By Squadron Leader R. F. Pemberton, M.C.

MR. ERNEST BEVIN'S statement on foreign affairs, delivered in the House of Commons on 22nd January, 1948, was declared by the less cautious of the daily papers to be indicative of a revolution in British foreign policy.

Whether it is indeed so depends, as Professor Joad would say, on what you mean by "revolution"; but none can deny that there are elements of novelty in it. The main proposal contained in the Foreign Secretary's speech was a Union of Western Europe. A Student of Europe, writing in *The Observer* of 25th January, 1948, said: "Britain, in the course of her history, has built many European coalitions to prevent the domination of Europe by any one Power. But until lately her island position, and the existence of many self-supporting and well-matched continental Powers, allowed her to do so by manipulating the European balance of power, as it were, from outside. *We were never forced to create a larger organic unit than we found in the existing European nation-States, let alone merge ourselves in such a European unit.*" (The italics are mine.) Therein lies the novelty.

The idea itself is not new. It has been put forward tentatively from time to time. But its almost sudden production at this juncture as a considered policy of His Majesty's Government, and the almost unanimous support it has received from the whole House (and indeed from the whole nation), suggest circumstances of exceptional interest and even of danger.

A Challenge to Democracy

What are these circumstances? In the first place, there is the breakdown of the London Conference of Foreign Ministers on 15th December, 1947, which was the culmination of a series of partial breakdowns in previous conferences. And the causes were the same in all: the intransigence of the U.S.S.R. The U.S.S.R. is deliberately preventing any satisfactory solution of the main problem, the settlement of Germany. She has built up for herself extensive and extending spheres of influence in Eastern, Central and South-East Europe. She dominates Poland, Czechoslovakia, Hungary, Rumania, Bulgaria, Yugoslavia and Albania, as well as the Eastern Zone of Germany; and she is now trying to establish her influence over Greece. She is opposing with all her influence the Marshall Plan for the economic recovery of Europe. The U.S.S.R. and her satellites now constitute a formidable *bloc* which is well cemented by treaties. Backed by the strength which these alliances give her and enjoying a commanding position in Europe, the Soviet Union can challenge any policy for European recovery that displeases her; and this she is doing in the hope that the economic distresses of Europe may be aggravated and that the whole Continent may become a fruitful field for the spread of Communism. This we cannot allow. Since "it is clear that we shall never be allowed to put things right with Russia's consent, the question has long been how much longer we are to wait before putting them right without it." ("Scrutator" in the *Sunday Times*, 18th January, 1948.) Now apparently Mr. Bevin has given the answer of His Majesty's Government to that question, and we are to wait no longer. Hence his proposal for a union of the nations of Western Europe.

Co-operation of some sort is obviously necessary if full advantage is to be taken of the aid offered by the U.S.A. in the Marshall Plan. Sixteen nations, including the United Kingdom, have signified their willingness to co-operate in accepting the proffered aid and in applying it to the economic recovery both of themselves individually and of Europe as a whole—or as much of Europe as will avail itself of the opportunity (for the nations under Russian influence have been forbidden by Russia to participate). The Marshall Plan, or "European Recovery Programme" as it is properly called, was and still is offered to all the nations of Europe who have suffered by the war, including, of course, Russia. But the Union of Western Europe now contemplated is far more than mere economic co-operation in implementing the Marshall Plan, though the latter may well be the first economic foundation upon which the Union may be built. Much more than economic co-operation, much more than a customs union, is required in the present circumstances. For the danger which threatens from the East is not only the danger that the Marshall Plan may be wrecked. It is a challenge to the very existence of Democracy as it is understood and enjoyed by the Nation-States of Western Europe.

Equilibrium with the East

For the present this challenge takes the form of quiet, steady and persistent infiltration of ideas, backed by strike action inspired by Moscow; but it may, in the not very distant future, develop into military aggression. The problem is therefore political as well as economic and must be solved by political as well as

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economic measures. Hence there must be some form of political association between the States of Western Europe to counteract the "peaceful penetration" of communist ideas and to organize the common defence of Democracy against them and against any possible military aggression. As Mr. Marshall himself pointed out on his return to Washington from the London Conference, "the free societies of the West must show that they have enough vigour to establish in fact an equilibrium with the East. It must be proved that Soviet leaders cannot indefinitely extend their power by trick devices of minority penetration and sabotage." And as Edward Crankshaw very succinctly put it in the *Sunday Times* of 8th February, 1948, "the first principle for us at this time of day, and the Russians know it, is to hold Communism back with one hand while creating a society impervious to it with the other." "Every single existing European State, including Britain," writes "A Student of Europe" in *The Observer* of 18th January, 1948, "is today obsolete both as an economic unit and as a defence unit. Not one of them can, on its own, guarantee its citizens their daily bread in peace and the safety of their homes in war."

In the past, the nations of Europe, or some of them at least, have been forced, for their own security, to form defensive alliances against a powerful aggressor. France under Napoleon in the early part of the nineteenth century, and Germany twice, under the Kaiser and Hitler, during the first half of the present century, caused coalitions of other European powers to be formed against them. But none of these alliances long survived the wars in which they were formed; nor were they political integrations, but only defensive alliances formed to counteract aggression and to defeat the aggressor. "Demands for a European State, intermittent in history, have usually arisen *either* from apprehension of some political danger *or* from the exploitation, by a national government, of cosmopolitan sentiment as an aid to national conquest. The present demand is due to the westward expansion of the U.S.S.R." (*The Times Literary Supplement*, 13th December, 1947). To this present demand, Mr. Winston Churchill gave public expression at the University of Zurich on 19th September, 1946.* "We must," he said, "re-create the European family, or as much of it as we can. . . . We must build a kind of United States of Europe . . . and we must begin now. . . . If at first all the States of Europe are not willing or able to join the Union, we must nevertheless proceed to assemble and to combine those who will and those who can." And on 19th January, 1948, Mr. Bernard Baruch gave to the Foreign Relations Committee of the United States Senate some concrete proposals to the same end, which included among others: (i) that the countries of Europe, as many as were willing, should band themselves into a political, economic and defence union under the United Nations; and (ii) that the United States, and such others as would join, should mutually guarantee the nations entering this union against aggression. (*The Times*, Washington Correspondent.)

"A Rendezvous with Destiny"

Thus with the positive inducements of self-interest and self-protection, encouraged by some of the best brains and most loyal friends in the Western Hemisphere, and spurred on by the Communist menace in the East, we are bound to go forward to what President Roosevelt so happily called "a rendezvous with destiny." The goal is defined, but the details have yet to be filled in and the way is far from clear. Mr. Bevin wisely forbore to sketch in any details, if indeed at this early stage it were possible so to do. It is sufficient at the moment that the goal has been defined; and though the matter is urgent and time presses, nothing is to be gained by premature fixing of details. To be in a hurry to settle details is to invite disaster, for it is upon matters of detail that the nations will disagree, and a too rigid adherence to what has been hastily decided may wreck the scheme completely. Let the details then remain fluid as long as possible and perhaps they will take shape of themselves. If the churn be rocked with patience, the butter will surely form.

Meanwhile it is well to recognize some of the difficulties and to consider the principles involved. Some valuable light is thrown on this by a review of Gordon Sewell's book, "Europe's Fate," which appeared in *The Times Literary Supplement* on 13th December, 1947. "Europe," the reviewer said, "is in some respects a cultural unit; but that is not to say that Europe should forthwith be federated. . . . National sovereignties are not necessarily the causes of war, and the absence of national sovereignties is no guarantee of peace. . . . The conditions of successful federation in America and Switzerland are not found in Europe." (This last fact was pointed out in the Editorial of the March, 1947, Number of the R.A.F. Quarterly.) And again, the same reviewer says: "A major political unit can be held together only by one of three factors: (i) the armed might of an oppressive government,

* See also R.A.F. Quarterly, Vol. 18, No. 2 (March, 1947), page 72: Editorial IV.

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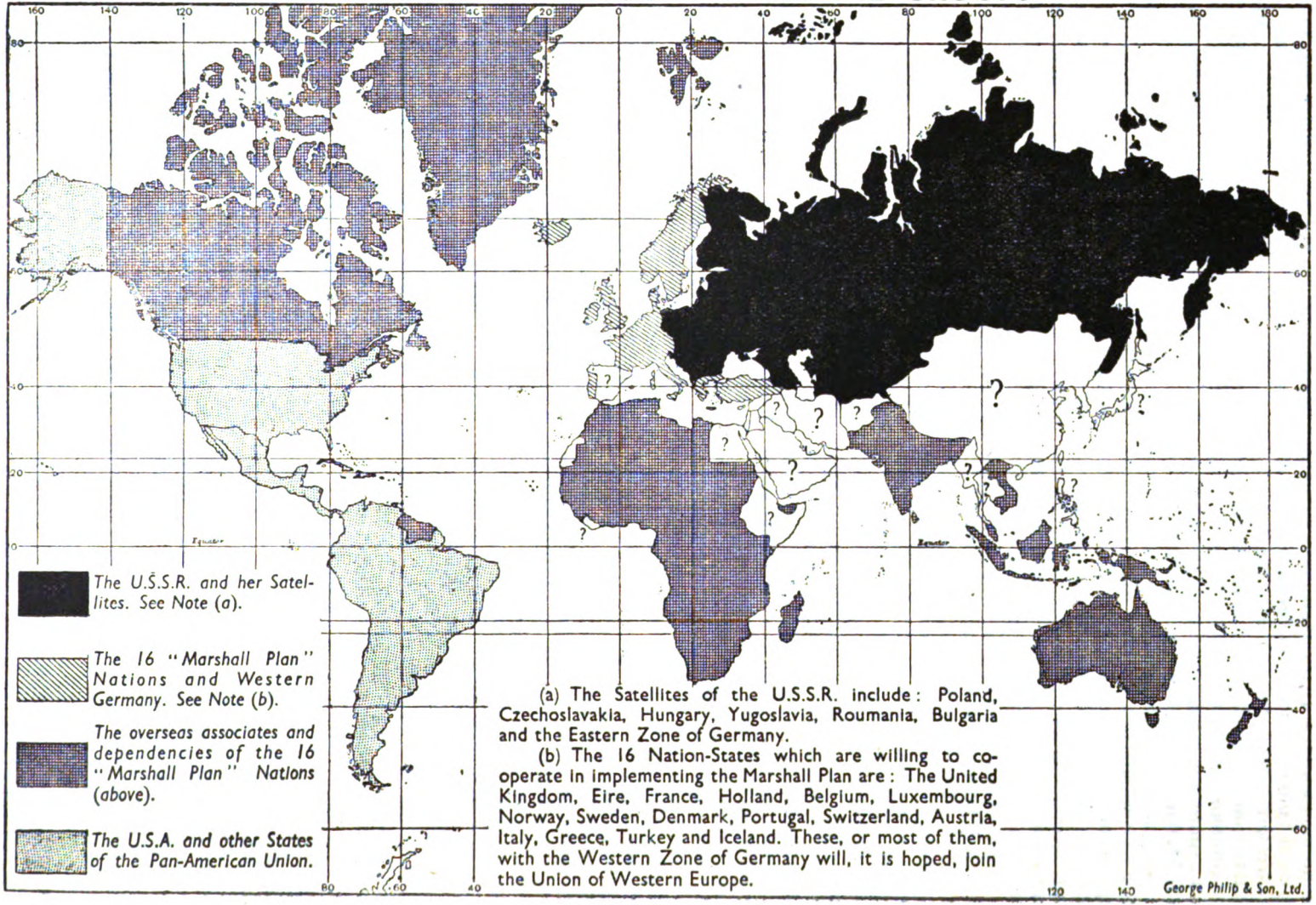
EASTERN AND WESTERN REGIONAL GROUPS


The U.S.S.R. and her Satellites. See Note (a).
The 16 "Marshall Plan" Nations and Western Germany. See Note (b).
The overseas associates and dependencies of the 16 "Marshall Plan" Nations (above).
The U.S.A. and other States of the Pan-American Union.
(a) The Satellites of the U.S.S.R. include: Poland, Czechoslavakia, Hungary, Yugoslavia, Roumania, Bulgaria and the Eastern Zone of Germany.
(b) The 16 Nation-States which are willing to co-operate in implementing the Marshall Plan are: The United Kingdom, Eire, France, Holland, Belgium, Luxembourg, Norway, Sweden, Denmark, Portugal, Switzerland, Austria, Italy, Greece, Turkey and Iceland. These, or most of them, with the Western Zone of Germany will, it is hoped, join the Union of Western Europe.
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(ii) the free and continuing consent of its members to a common body of political conviction, or (iii) a sentiment, similar to that of family loyalty, known as patriotism." We may rule out the first for Europe, as no existing State but the U.S.S.R. would wish to produce unity in that way, and in any case Europe would not stand for it; so there remains either "a common ideology or a new patriotism stronger than national patriotisms and doctrinal loyalties." "Yet the principal cause of our present discontents," continues the reviewer, "is precisely the conflict of several fundamentally opposed doctrines, all of which are strongly represented in Europe. The tension between them is at present prevented from developing into open war only by the strength of national feeling which . . . has succeeded so far in avoiding conflict. Can then the common cultural heritage of Europe be made the basis of a sense of community sufficiently strong to make political unity possible?"

INDEPENDENCE AND INTERDEPENDENCE

Assuredly the difficulties are great; but the need is greater. And given the will to unite, which seems to exist among the principal nations concerned, and the strongly expressed approval of the United States of America and of the dominions of the British Commonwealth, the question resolves itself into one of means or method. What method of union seems most appropriate to Western Europe today? Clearly the several nations concerned are not going to surrender completely their individual sovereignties in favour of one common sovereignty for all. Such a thing is neither practicable nor desirable. Federation is therefore put forward by some as a method of association suitable for Europe as a whole or for part of Europe; but a federal constitution is said to be the most difficult to work, and to be workable at all it requires that its member States shall have a good deal more in common than have the States of Western Europe. G. M. Young, writing in the *Sunday Times* of 1st February, 1948, suggests a union formed after the model of the British Commonwealth of Nations, a union "neither unitary nor federal, almost impossible to define in the traditional terms of political science but best described as 'a perpetual association based on the principles of independence and interdependence.' " There surely we have the germ of European unity—"independence and interdependence." These two words are singularly appropriate to the present conditions of the Western European nations. So perhaps an association that has been evolved by, and found suitable for, the independent and interdependent States of the British Commonwealth may be suitable also for Western Europe.

On the other hand, it may be—indeed it is very likely—that no existing association will serve as a model for the Union of Western Europe. Every existing type of association has been evolved to meet some special need in special circumstances, and only when similar needs have arisen in similar circumstances have existing types of association been successfully adopted or copied. When it became necessary to define in some sort the independent status and free association of the self-governing Dominions of the British Crown, the phrase "Dominion Status" was coined and adopted; and the Statute of Westminster (1931) codified their relationships with the Mother Country and with each other. This free association of independent Nation-States is unique because the circumstances of its origin and successful maintenance were and are unique; and there is no parallel between the circumstances of the independent member States of the British Commonwealth and the no less independent and self-conscious States of Western Europe. For that very good reason it would seem to be obvious that some new form of association will have to be evolved to meet this particular project of a Union of Western Europe. That this can and will be done there need be no doubt, but it will take time. Though the need is urgent, much deliberation will be necessary. Above all, whatever form of association is evolved, it will have to be extremely flexible—for a time at least—so that it may adjust itself to the peculiarities of the associated nations.

THE PROPOSED ASSOCIATION

Consideration of Mr. Bevin's proposal reveals a statesmanship worthy of any British Government. There is a magnitude in the conception which takes the whole world in its stride. Not only are the States of Western Europe, or as many of them as will agree, to be united in one association, but this association is to be logically extended to include all the overseas territories of those States and their independent associates as well. Thus, besides all those sixteen nations who have agreed to implement the Marshall Plan, or at least most of them, the association will, it is hoped, include Canada, Australia, New Zealand, the Union of South Africa, India, Pakistan, Ceylon, all the British dependent Empire, all the French, Dutch, Belgian and Portuguese colonial possessions in Africa, Asia and America with the possible additions of Indonesia and Indo-China as well. This exten-

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sion of the proposed association of Western European nations is both logical and necessary, because the European States it is proposed to unite depend to a great extent on their extra-European territories and associates for their raw materials and markets. They are all to a great extent economically interdependent and are thus fit subjects for political association. United they would form a unit of such solidity, economic strength and military might that no other Power would dare to challenge them. (*The territories to which it is hoped this extended Western Union will apply are indicated on the accompanying map, on which may also be seen the territories controlled by the U.S.A. and the Pan-American Union. For purposes of comparison, the territories under the influence of the U.S.S.R. are indicated as well.*) And here it may be well to recall the words of Mr. Hector McNeil, Minister of State, who said: ". . . This association upon which we are entering has not been built up by anyone else except Generalissimo Stalin. He is the architect of any coalition which forms against him." (*Hansard*, House of Commons, 22nd January, 1948).

Western Europe is in great peril. The liberties and independence of its peoples are threatened. Nothing short of political union will suffice to integrate the material and moral forces of the Western European nations and to weld them into a force capable of holding in check the integrated forces of Russia and her satellites. As the Belgian Premier said: "The West cannot remain unorganized while Eastern Europe is organizing." The peril is twofold. There is a military threat and there is a political threat; and each must be countered in a different way. But in both cases unity is essential among those threatened.

Military and Political Dangers

Taking the military danger first, it is clear that the nations of Western Europe must pool their military power and resources and make them adequate for joint self-defence. This will necessitate a Joint General Staff and the establishment of a common defensive frontier from the Baltic to the Adriatic. It will also necessitate the sharing of the economic burden of defence in proportion to the wealth and resources of each nation, as well as the pooling of essential research establishments and armament industries. All these might be carried out on a basis of a defensive alliance between the nations concerned; but they would be far more effective and enduring on the basis of some form of organic political union. Turning now to the political danger, "A Student of Europe," to whom I am indebted for most of this paragraph, writing in *The Observer* of 25th January, 1948, says: "More immediate than the military threat is the political threat from the East. Russian military power stands in reserve. The Communist political offensive against Western Europe is in full swing. Its strategical objective, the defeat of the European Recovery Programme, has been openly proclaimed by the leaders of the Cominform, and the events of last autumn in France and Italy have shown that this is no empty threat. It is this uncanny political threat from within . . . which now puts Western Europe on its mettle. Political battles cannot be won in any other than the political field. The decisive weapon with which they are won is the power of an idea—but of an idea carried into the streets and the homes, and capturing the imagination, the enthusiasm and the devotion of men and women. The great idea of Western European Union has now been proclaimed: it is grand and simple, inspiring and plausible, and it can defeat the Communist gospel where it must be defeated —in the minds of European people."

Western Europe is not alone in her danger. There is also that great, powerful and wealthy Nation-State beyond the Atlantic. She also regards the Communist threat to Western Europe as a threat to herself; and is ready to take her share in the defence of Democracy. Behind her stand also the independent democratic republics of Central and South America. So that, although there is no present suggestion of extending the Union of Western Europe to include the Nation-States of the Western Hemisphere, these are undoubtedly valuable allies for the Union.

* * *

Since the foregoing was written, significant developments in the international situation have confirmed this appreciation and shown that the danger is increasing. I refer to the February *coup d'état* in Prague and to the "invitation" from the Soviet Government to Finland to form a military alliance with them.

"The rape of Czechoslovakia," as "Scrutator" calls it, is significant because it is "plainly a war measure," there being no need for it unless real war is contemplated. It is significant also as further evidence that war of a kind has already begun. It is significant too as another step in the progress of Russian expansion by methods once so consistently Hitler's and now all-too-familiar as Stalin's. And it is significant again as indicating the way in which Italy and France may in turn be attacked. If they fall, the Marshall Plan connot be implemented and a Union of Western Europe will be impossible.

Happily, news from Brussels on 6th March indicated that agreement had been reached on the main principles of a Fifty-Year Five-Power Western Union Treaty.

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"Accurate Bombing"

By Wing Commander J. B. Tait, D.S.O., D.F.C.

(Contributed to the series, "Lessons I have learned from the War")

" 'I will do my best, as Hubert says,' answered Locksley; *'no man can do more.'*

"So saying, he again bent his bow, but on the present occasion looked with attention to his weapon, and changed the string, which he thought was no longer truly round, having been a little frayed by the two former shots. He then took his aim with some deliberation and the multitude awaited the event in breathless silence. The archer vindicated their opinion of his skill: his arrow split the willow rod against which it was aimed."

"Ivanhoe."

INTRODUCTION

THE great lesson of the war for a bomber pilot was bombing accuracy. It was a double lesson: how to achieve it, and what its implications were. This paper is a summary of what a bomber pilot learnt of accurate bombing during the war. It is restricted to the principles and technicalities of destroying targets by bombing; it does not consider the strategic conduct of the bomber compaign, and since by the terms of reference it is a personal record it is confined to the European theatre.

The lesson is contained in the development of bombing technique between the outbreak of the war and its conclusion. The aim of this paper is to trace the progress of this development, which in itself is a statement of the knowledge gained by experience, to examine to what extent accuracy is important, and what degree of accuracy is desirable, particularly in relation to weight of bombing effort; and finally to suggest how experience during the war and post-war analysis of the bomber offensive indicate directions of future development.

For this reason an essentially critical viewpoint has been adopted. Progress and improvement in policy, technique and equipment, can only result from critical examination of what has already been achieved; therefore, limitations and disabilities are stressed. It is a dangerous delay to thought to rest in the comfortable mental haven of "we won the war." A more prudent premise is to consider everything which exists at the end of the war out of date and capable of necessary improvement. Possible enemies will study our successes and achievements; we shall profit more by examining our failings. At the end of the First World War the German General Staff set to work to discover why we won, in such detail that they even tried to analyse the British sense of humour inspiring Bairnsfather cartoons. Before the second had ceased, the Chief of Staff of the Luftwaffe, General Koller, writing his memoirs under the very shadow of the advancing Allied armour, sought the reasons for defeat again.

His brief, vivid memoirs conclude bitterly with "Views on the Advance of the Enemy Forces," and although they are too long to quote fully, one paragraph contains the germ of his thoughts:

> "As long as we had air supremacy, nobody threatened our industries or the peaceful life of our homeland; our lines of communication in the Mediterranean were not interfered with. If our air supremacy had been kept up right from the beginning and at the cost of other armament programmes we would not have been defeated in Africa or in the Mediterranean area.
>
> "German air supremacy—and we would have been able to maintain a capable industry and intact lines of communication; German air supremacy—and England's supplies would have been badly damaged before she could have built up her maximum war production. German air supremacy—and this massed concentration of strong air forces would not have been as easy as it was. German air supremacy—and there would have been no invasion, or it would have been turned back with the loss of much blood."

The German General Staff no longer threatens our security, but others are probably pursuing these studies.

Air supremacy will dominate strategy until aircraft are no longer weapons but only transporters, but the means of gaining it may change. In the last war air supremacy was held or lost by fighters. When the German and Japanese fighters could no longer prevent the Allied bomber formation ranging over their homelands, Allied air supremacy was complete.

But to discover the secret of a successful achievement is to learn only how to imitate it. The more critical approach leads to the way ahead, and for our future whose security now depends on our foresightedness and ingenuity and not on quantity, the motto recently coined by the Duke of Gloucester is apt: "Nothing is good enough." It is believed that the fighter is no longer

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dominant and that the bomber arm cannot be neglected, as part of defence, as it was in the years before the war.

As a premilinary, and to establish the level from which bombing technique rose during the war, it is worth recalling briefly the equipment and state of Bomber Command immediately before the war.

During the uneasy eighteen months before the war began, the ordinary bomber pilot's acquaintance with bombs was slight. The meagre stock of bombs could not be spared for live-bombing practice and demonstration, even if there had been accessible ranges; so that, influenced by the official history of World War I, in which attacks on cities and marshalling yards with bombs of between 40 and 120 pounds were described as successful, an exaggerated estimation of the power of bombs was produced. Bombs were taken for granted, the 250-pound G.P. a potent weapon, the 500-pound devastating. This had a deleterious effect on the importance ascribed to accuracy, as it was assumed that a few sticks dropped across most targets—marshalling yards, oil refineries, factories—would do untold damage, and the size of such targets would absorb bombing errors since, with care, it was possible to obtain an average error of about 100 yards on the practice range.

The standard bombsights for high-level bombing were the Mark IX and the Automatic Bombsight.

When the war had been in progress about a year a critical pupil at Manby with a mathematical flair on one occasion arranged a small demonstration. There was a demonstration sight on a mounting about 4 feet off the floor. He enveigled several instructors in turn to take an aim through the sight, and on the floor he made a small mark, invisible to the subject, where each one described his point of aim. The variation between the various marks amounted to 2 inches. Converted to 10,000 feet that represented an error of about 140 yards—before any bombing errors had been introduced.

The Automatic Bombsight, unstabilized, is unusable in any aircraft which will not flat-turn, therefore in all the monoplanes which came into service just before the war.

The tardy preparations for the approaching war did not permit the limited resources of scientific research to be spared from the priority of the Fighter arm which was to hold the old defence line of the Straits of Dover, England's ultimate bastion since Alfred the Great.

The Bomber arm had no navigation equipment except map and compass, no accurate bombsight, no means of locating a target when map-reading was not possible. Tactics had not been worked out for the sort of tasks it was to be called upon to undertake.

There is no profit to be gained from reciting the catalogue of unpreparedness, the consequences of which are now only too evident. It is intended only to emphasize that the following outline of the development of bombing technique is an account of what was learnt during the war, and that the beginning was a state of poverty, material and mental.

* * * * *

THE DEVELOPMENT OF BOMBING TECHNIQUE

The Dark Ages

Such was the situation at the outbreak of war. During the first half of the war the standard of bombing in Bomber Command deteriorated, instead of improving, as pre-war crews were replaced by those trained in the most difficult period when the shortage of aircraft, bombing ranges and time relegated practice bombing to a low priority.

One example can be quoted of the inability to achieve precision. The German ships, *Scharnhorst* and *Gneisenau* were based during 1941 on the French West Coast ports where they were frequently attacked to keep them out of action. On 18th December, 1941, when they were both in dry dock in Brest, they were attacked in daylight by all the heavy bombers Bomber Command could muster—about fifty—with 2,000-pound A.P. bombs. One hit was scored on one ship, for the cost of several aircraft lost and many damaged. Most of the aircraft were equipped with the Mark IX bombsight. The operation was repeated the following January with a similar result, and in February the ships sailed for German ports.

While these ships lay on the flank of our main convoy routes they had to be kept out of action, and this could only be done from the air; in fact, they were damaged frequently enough to prevent their putting to sea, until the German High Command decided that Brest was untenable and withdrew them, but the scale of effort required by Bomber Command to score an occasional hit was too high. The 2000-pound A.P. bomb was not potent enough to cause much damage with one bomb, and bomb-aiming was not accurate enough, even in daylight, to obtain the concentration of hits required. One hit amidships by a heavy bomb on each of these ships would have put them out of action for at least six months, if not permanently, but even if such a bomb had

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existed then, the chances of hitting a target with single heavy bombs instead of sticks of small ones was too low to be profitable.

The war eventually showed that the bomber could sink any battleship, or disable it in dock, provided that it had a weapon powerful enough, and the means of aiming it. If Bomber Command had had heavy bombs and accurate bombsights the *Scharnhorst* and *Gneisenau* could have been put out of action in one attack, instead of by a costly process of attrition.

In fact, Bomber Command was not equipped or trained for this sort of operation, or any other type of precision target. The main task was to destroy German industrial cities, and the fundamental problem that of locating such targets in darkness and bad weather; while this latter problem remained unsolved, that of aiming bombs was a secondary one.

The first lesson of the war for a bomber pilot was a negative one; that any operation will only succeed to the degree that the equipment, the tactics and the efficiency of the crews are adequate for the task. Equipment is not everything; a good plan, which takes into account the limitations of the equipment available, can circumvent many deficiences. The weapon must be adequate for the task, however. If the weapon is unsuitable or not powerful enough for the task, the operation is almost certain to fail. The first year of operations revealed the distressing inadequacies by which the Command was haltered.

The Renaissance

During 1943 bomb aiming rose out of the slough in which it had been submerged. The problem of locating targets was solved by radar and by marking them with target indicators clearly visible from a distance, thereby reducing the crews' task to one identical to that of aiming at the target on a bombing range. The Mark XIV bombsight came into service, which was a great improvement on the old equipment, although not the foolproof magic box it was believed to be in the first wave of optimism. The more precise an instrument the more care has to be used to get the best results, and this is as true for bomb-aiming as any other mechanical process. A truthful comment on the average accuracy of Bomber Command at this time is that it was poor, but time and training remedied this, and the size of the targets then attacked absorbed the individual errors. Later, such improvement had been made that much smaller targets were attacked with success. During the last two years of the war Bomber Command became progressively more accurate and versatile until it exceeded the expectations of the Commander-in-Chief himself in ability to destroy small targets.

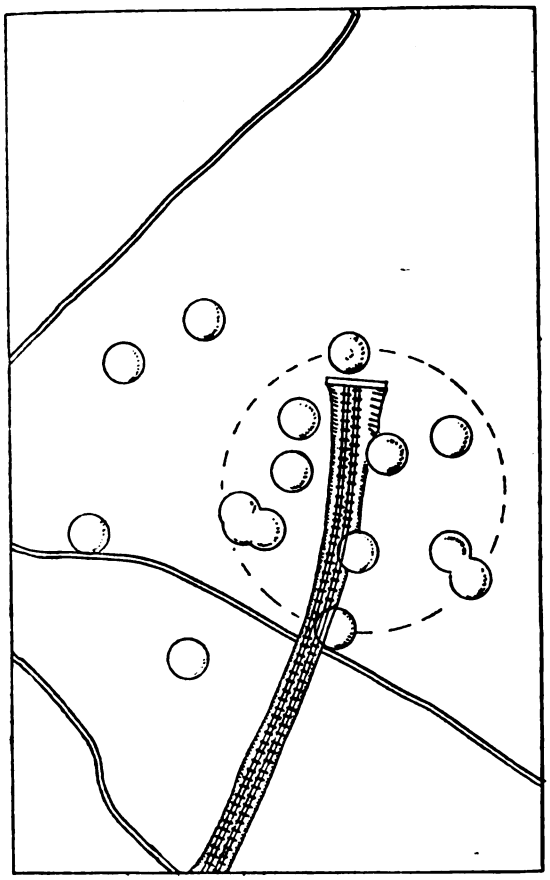

Fig. 1. Attack on Saumur Tunnel, 8th/9th June
(Dotted circle indicates 75 % zone)

He afterwards wrote, concerning the operations against the French railway targets: "There was, of course, no reason to believe that the bombing would be as accurate as it proved to be, and I myself doubted whether we could achieve the extraordinary precision needed if the project was to succeed."*

The equipment of 617 Squadron with the modified type of the stabilized automatic bombsight (SABS. Mk. 11A) produced a small force which could hit precision targets. During the winter of 1943-44, led by Cheshire, it set a new standard for precision night bombing; first by marking the target visually from low-level by the light of flares, more accurately than Oboe and without its range restriction; secondly, by accurate bombing with a tachometric bombsight; thirdly, by using 12,000-lb. bombs which were

* *Bomber Offensive*, p. 197.

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powerful enough to destroy the targets they hit. In the series of attacks on the French aircraft factories which the enemy was using to repair aircraft, such as the Gnome-Rhone at Limoges, direct hits on the shops caused them to collapse into heaps of rubble.

The attack on the Saumur tunnel on the night of 8th/9th June, 1944, is an example of the accuracy possible. The bomb-plot is shown diagramatically in Fig. 1. The salient features are the circular shape of the bomb pattern, its compactness and the distribution of the bombs, most concentrated in the centre and sparser towards the outside of the pattern. The result of the attack, which the diagram does not show, was the destruction of the cutting for about 100 yards from the tunnel mouth and the collapse of the roof by a direct hit on the tunnel. The tunnel would have been blocked for the duration of the campaign in France even if the enemy had been able to proceed to repair it.

The bomb-plot illustrates the importance of accuracy when heavy bombs are used. The real damage was caused by the bomb which hit the tunnel roof: The craters on the railway outside the tunnel could have been filled fairly quickly. With lesser accuracy the chance of a hit on the vulnerable point of the target would have been slight. As it was, the hit was partly fortuitious because the centre of the bomb pattern did not coincide with the tunnel mouth. Greater accuracy would have caused more damage.

The result of this operation indicates the progress which had been made since Bomber Command could not find a target at night or hit it by day, and later operations provide examples of various types of targets eliminated by the effective use of appropriate weapons and scales of attack.

Typical ones are the breaking of the Bielefeld Viaduct by one near-miss with a Grand-Slam after many attacks with medium-calibre bombs had failed; any of the attacks on French marshalling yards, contrasted with the failure of similar attacks on Hamm, in 1940; and the full-scale incendiary attack on Dresden as an example of mass destruction.

The process of improvement was continuous, and after 1943 was due to the development of tactics and training. No new equipment of significance was introduced after 1943, but from the analysis of accumulating operational records it was possible to compare the efficiency of different techniques and devices under various conditions, develop new tactics to obtain better results from the equipment and plan attacks with greater certainty, selecting the most suitable method of attack for the particular conditions of any target.

The remainder of this section is a summary of bombing technique as it had developed by the end of the war, from the aspect of bombing accuracy in its broad meaning of ability to destroy a target.

Factors of Bombing Technique

By the end of 1943 the experience of the war and the development of equipment made possible the proper planning of attacks. The target could be located, more accurate bombsights were available and the limitations and capabilities of various methods were known. The object of planning was to decide the best method to destroy the target. There were several target-marking techniques, each with its own characteristics, a wide range of bombs, different types of bombsight. It was necessary to select the combination which would achieve the aim of the operation, taking into account modifying factors such as the influence of range, enemy defences, or the weather on the methods which would be used.

The war has shown that it is insufficient merely to damage a target so that the enemy can fairly quickly repair it; it must, if possible, be made unusable, and this usually entails complete destruction. There are certain targets, such as bridges and canals, which can be replaced fairly quickly, but in such cases complete destruction will cost the enemy greater effort than if the structure is damaged but repairable. There were many targets which had to be attacked again and again to keep them out of action, not because the weight of bombs dropped on each attack was insufficient to destroy them, but because too few of the bombs hit the target. The *Scharnhorst* and *Gneisenau* have already been quoted; another type of target was the synthetic oil plants over which a long war of attrition was waged by the bomber forces against the German repair organization, until bombing technique improved to the stage where a plant could be permanently destroyed by one attack.

It is clear now that the nature of the target is the first factor in planning, determining the type of weapon to be used and the number and concentration of hits required, from which follows the bombing pattern and the force of aircraft needed to obtain it. The bombing pattern depends on the bombing accuracy of individual aircraft. The three factors, weapon, size of force and accuracy, can often be considered as quotient: A target may be destroyed by a concentration of small bombs or a few heavy bombs; the concentration may be obtained by a small

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force with a high accuracy or a larger force with lower accuracy; the heavier, and therefore the fewer the bombs used, the greater the need for accuracy, or alternatively the larger the force needed. The bombing pattern is the crux of the problem. During the war the Operational Research Section kept detailed records of bomb patterns produced in operations and from this accumulated data could finally calculate all the statistics required for accurate planning; such recording and analysis is absolutely necessary for proper planning.

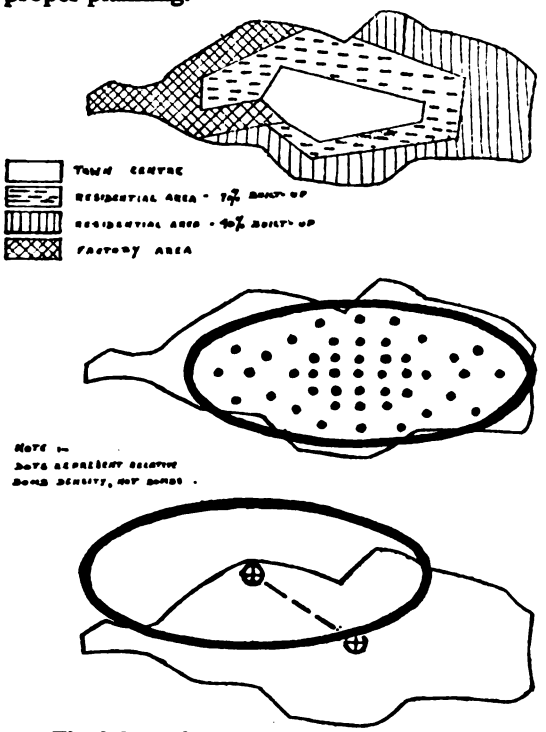

Fig. 2. Manufacturing Town as Area Target

Two hypothetical examples of targets will illustrate this. The first is a large industrial town covering an area of five square miles, containing factories, administrative buildings, power stations, railway yards and dwelling houses (Fig. 2); the second is a battery of four coastal defence guns in concrete emplacements, situated at the corners of a 100-yards suare with a control post in the centre (Fig. 3).

The first target requires to be covered by an even pattern of many bombs so that all the individual items in the area, buildings, railways, machine shops, etc., are hit by sufficient bombs to destroy them. There is a considerable area of open space in such a target, usually more than 50 per cent., made up of parks, gardens, and streets, which will be covered by bombs causing unavoidable wastage, but if the bomb pattern falls completely within the target area the bomb wastage is kept to a minimum (Fig. 2); if the bomb pattern spills over the edge of the target area because the bombing accuracy is not good enough, there will be greater wastage (Fig. 2). The density of the pattern itself is important: the pattern may be too open for the type of target, the spacing between individual bombs too great due to a combination of an inadequate force of aircraft and too low an average accuracy of individual bomb-aiming. For example, if small incendiary bombs are used the density of the pattern may be such that on the average one building out of two is hit by one bomb, which can be extinguished by the fire guards; a denser pattern causing each building to be hit by two or three bombs would overwhelm the fire guards.

The second target example, the gun battery, is among the most difficult. The vulnerable

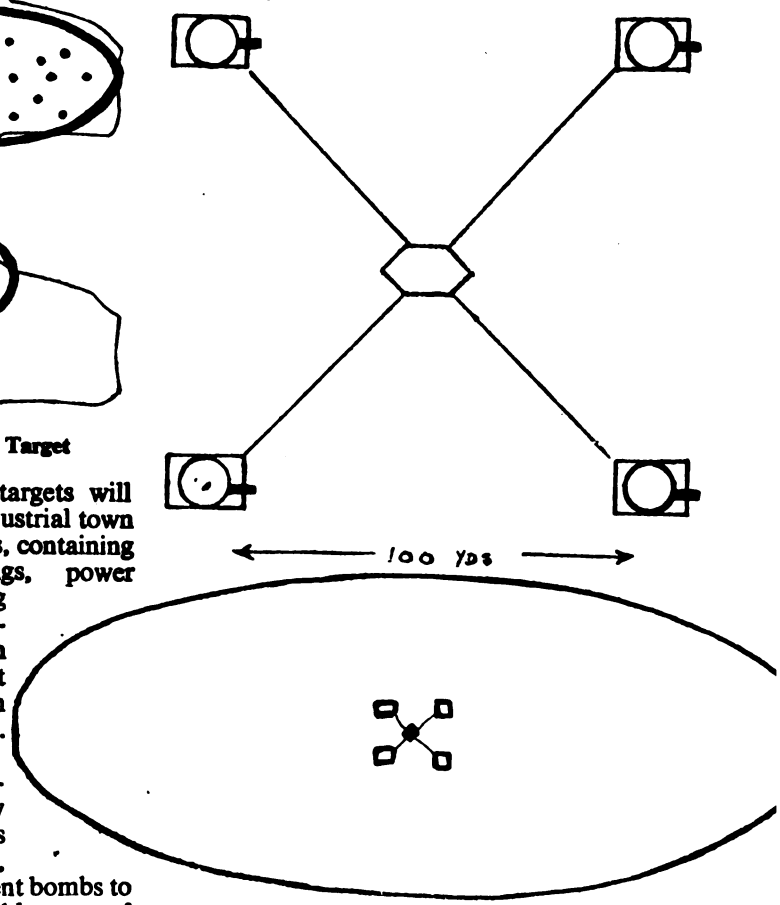

Fig. 3. Gun Battery as Precision Target

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points are small and strong, the whole area of the target is small and consists mainly of open space. To destroy the battery each gun emplacement must be hit individually by enough heavy bombs to damage the gun irreparably. A number of bombs in the target area might knock out the control gear and ammunition supply, but these would probably be repairable in a fairly short time and would not guarantee the battery being out of operation. The attack would probably be made in preparation for a forthcoming landing operation and would not, therefore, be left to the last moment because of the unreliability of the weather. If the bombs used are heavy enough to destroy a gun by one hit the pattern of bombs in the target area must be so close, to ensure hitting each gun, that the craters interlock; if the bombs are not potent enough to destroy a gun with one hit but need two or three, the bomb pattern must be correspondingly denser. To obtain the maximum effect from its bombs the force must place all its bombs in a hundred yards square, which is impossible with existing equipment; the bombing pattern will, therefore, overlap the target area and only a fraction of the effort, represented by the ratio of the area of the target to the area of the bombing pattern, will be useful (Fig. 3). It follows that the number of hits on the target will be in proportion to the *square* of the accuracy.

During the war operational research found that the bomb-pattern produced by a number of aircraft each dropping one bomb on the same target, was circular, and that bombs in this pattern had a Gaussian distribution, that is, they were most concentrated in the centre and decreasingly so towards the circumference. This was true for both vector and tachometric sights. If the aircraft flew on the same heading and dropped sticks of bombs the pattern was elongated by the distance represented by the length of the sticks. Bombs could not be dropped in salvo because of the danger of jostling, so unless each aircraft carried one bomb only, or dropped each bomb separately—which was not often possible for tactical reasons—the bombing pattern was elongated. This is an important factor in planning an attack: The bomb pattern must be best matched with the target; if the target is elongated the direction of attack should be along the target.

It is clear that to obtain the most hits on the target the centre of the bombing pattern must coincide with the centre of the target: This is true whether the target area is large or small in comparison with the bomb pattern. If the target is small it will ensure the densest part of the bomb pattern, the centre, falling on it; if the target is large it will ensure the bomb pattern being contained by the target area and not overlapping on one side. Centering the bombing pattern on the target depends on the accuracy with which the target is located or marked, and a number of factors concerned with bomb-aiming which are discussed later.

It makes no difference whether the pattern is produced by many bombs dropped by a large force of aircraft, or one very powerful weapon, such as an atomic bomb. An atomic bomb produces a circular pattern of greatest destructive power at the centre, decreasing outwards. The principle is the same. The destructive power of the bomb concentration should be sufficient to destroy the targets it falls on, otherwise the area is under-hit; the bomb pattern must be centred on the target or part of the effort is wasted. The density of the pattern is affected by the average accuracy of the individual aircraft, and the centering of the bomb pattern depends on the accuracy of the location or marking of the target. The bombing efficiency of a force is the combination of these two factors.

It may appear from the above that for an attack by a strong force on a large target too high a standard of bombing accuracy is undesirable, because it produces a dense pattern in the centre of the target, wasting effort by over-hitting, and leaves the outside untouched. In fact, bombing accuracy cannot be too high; it is a matter of adjusting technique to use it. No target area is homogeneous; it consists of numbers of individual targets within the area, all requiring different weapons and concentrations for the optimum results. Few targets are of a regular shape which a bomb pattern will fit: A city may have an outlying industrial area which requires separate treatment. The better the bombing efficiency of a bomber force, the more a complex target can be divided into separate zones and the total force divided between these zones, so that the complete bombing pattern is built up of a number of separate patterns. By the end of the war Bomber Command was able, by using its improved accuracy, to inflict equal damage with about one-third of the weight of effort required a year previously, and the results showed the desirability of still greater accuracy to reduce bomb wastage. To carry the argument towards the extreme, if every aircraft were capable of locating and hitting with every bomb a selected building in a town, the bomb wastage would be greatly reduced and the scale of effort to destroy a small target reduced to a small fraction of that required during the war. There is no limit to the degree of accuracy desirable. Accuracy gives economy and versatility.

From these principles of planning the sphere

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of the mathematicians, the next stage is the methods by which they were applied. The degree of accuracy depended on the target, the weather, the technique, and lastly, the aiming of the bomb. The character of the bomb pattern entirely depended on this last factor, and as accuracy is a matter of eliminating errors the causes of errors must be examined first.

Sources of Bomb-Aiming Errors

To avoid confusion the term "bomb-aiming" will be used for the techniques of aiming a bomb at a mark, "bombing" to denote the whole process of locating and destroying a target, and "blind bombing," bombing through cloud.

When the target can be located, bombing accuracy is the distance from the aiming mark within which individual aircraft can place their bombs. The mark may be the target itself in daylight or a pyrotechnic marker at night, accurately laid. During the war accurate bombing could be obtained only if there was a visible aiming mark on the target.

Blind bombing was used extensively because the weather imposed it, but the limitations of the equipment available put it out of the classification of accurate bombing. The four main systems used, in reverse order of accuracy were: Target-marking by parachute flares with H_2S; bombing with H_2S: Target-marking by parachute flares with Oboe; bombing with Gee-H. H_2S was not a precise instrument. Sky-marking

TABLES SHOWING BOMBING ERRORS CAUSED BY VARIOUS FALSE BOMBSIGHT SETTINGS OR CREW ERRORS, CALCULATED FOR THE PERFECT BOMB

TABLE 1.—FALSE WIND OR AIRSPEED.

	Resulting Bombing Error		
Altitude	10,000 ft.	20,000 ft.	40,000 ft.
5 m.p.h. Vector Error	61 yds.	85 yds.	122 yds.
10 m.p.h. Vector Error	122 yds.	170 yds.	244 yds.

Bombing Error does not vary with the speed of the aircraft but increases in proportion to the vector error in wind or airspeed set on the bomb-sight, and in proportion to the square root of the altitude.

This is a random error.

TABLE 2.—FALSE HEIGHT.

	Resulting Bombing Error		
Ground Speed	200 m.p.h.		
Altitude	10,000 ft.	20,000 ft.	40,000 ft.
100 ft. Setting Error	12 yds.	9 yds.	6 yds.
300 ft. Setting Error	36 yds.	27 yds.	18 yds.

	Resulting Bombing Error		
Ground Speed	500 m.p.h.		
Altitude	10,000 ft.	20,000 ft.	40,000 ft.
100 ft. Setting Error	30 yds.	22 yds.	15 yds.
300 ft. Setting Error	90 yds.	66 yds.	45 yds.

If the height is overset on a vector bomb-sight, the bomb will overshoot; if overset on a tachometric bomb-sight the bomb will undershoot. The bombing error varies in proportion as the ground speed and inversely as the square root of the aircraft height.

This is a range error.

TABLE 3.—DEVIATION OF AIRCRAFT FROM CORRECT HEADING.

(All bomb-sight settings are correct and the aircraft is at the correct position at the moment of bomb release, but the bomb-sight graticule passes to one side of the target).

	Resulting Bombing Error		
Ground Speed	200 m.p.h.		
Altitude (feet)	10,000	20,000	40,000
1° Heading Error	41 yds.	58 yds.	82 yds.

	Resulting Bombing Error		
Ground Speed	500 m.p.h.		
Altitude (feet)	10,000	20,000	40,000
1° Heading Error	102 yds.	143 yds.	203 yds.

The bombing error increases in proportion to the ground speed and the square root of the height.

This is a line error.

TABLE 4.—ERROR IN TIMING MOMENT OF BOMB-RELEASE.

(Non-automatic bomb-sights only).

	Resulting Bombing Error	
Ground Speed	200 m.p.h.	500 m.p.h.
0.1 Sec. Error	10 yds.	24 yds.
0.2 sec. Error	19 yds.	49 yds.

The bombing error increases in proportion to the ground speed.

This is a range error.

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was not an accurate bombing technique, however accurately the flares were placed, because it depended on the bombing aircraft aiming, on a pre-calculated heading, at a flare floating downwind for about two minutes. The deficiency of blind bombing with Oboe was due to the sky-marking technique, and not the Oboe system, which was capable of an average accuracy of about 100 yards, but could handle only one aircraft at a time and could not be used profitably for bombing. Gee-H was the only system independent of cloud, but although similar to Oboe, was less accurate, had the same range restriction and could handle only a moderate-sized force of aircraft. The average error was too great to produce a bomb pattern concentrated enough to be certain of hitting a small target.

Accurate bombing was, therefore, a matter of aiming with a bombsight at a mark on the ground, and it will remain so until some revolutionary development in blind bombing occurs.

Basic theory provides some informative data on factors which determine the accuracy of bomb-aiming, and as a preliminary to discussing bombsights the simple tables (page 85) have been inserted to illustrate the fundamental errors. The tables have been calculated for the ideal bomb, but the errors for real bombs are practically the same, especially for heavy, high-terminal-velocity bombs for which accuracy is most important.

The tables show that one of the largest bombing errors results from a false wind. The wind, due to its variability, is the most difficult of the factors contained in the bombing calculation to measure accurately, and is usually responsible for a large part of the bomb-aiming error. A wind vector error of 5 m.p.h. at 10,000 feet causes a bombing error of over 50 yards: This is independent of the actual wind velocity and the airspeed, but increases as the square root of the height.

The difficulty in measuring the wind precisely for accurate bombing is that the wind found must be that at the appropriate height over the target at the moment of bomb release. A navigational wind, measured over the final part of the route to the target is the average velocity of the wind in that area and is not accurate enough; even a wind found over the target fifteen minutes before bombing may vary by 5 m.p.h. from that at the moment of bomb release, because velocity contains direction as well as speed. Wind determination must have special attention for accurate bombing.

The other factors, airspeed and height can be measured accurately with standard aircraft equipment, and the human factors of flying the aircraft and releasing the bomb, if not done mechanically, are a matter of skill. The importance of these figures, considered as a whole, is that all errors, of different sizes, are independent and cumulative. A small error is not absorbed in a big one. Every source of error should be considered separately to reduce the total error to its possible minimum, otherwise elimination of a large source of error may be countered by the sum of several minor ones. However small an error, it may be just the difference between hitting the edge of a target and missing it.

As an example, consider the effect of the sum of errors which might be obtained under average operational conditions without concentration on precision: 5 m.p.h. wind error, 300 feet height error, one degree heading error 0.1 seconds release timing error. At 200 m.p.h. ground speed, 10,000 feet altitude, these would cause errors of 61 yards (random), 36 yards (range), 41 yards (line), 10 yards (range). Solving the right-angled triangle of line and range errors to find the hypotenuse, and adding the random error due to wind, gives a possible distance of the bomb from the aiming point of 122 yards. At 500 m.p.h. and 40,000 feet the same errors would produce 337 yards.

The average of a number of bombs dropped under these conditions would be considerably less because the errors will tend to cancel out. In assessing bombing, however, the average distance of bombs from the target is not the criterion: The bombing pattern is bounded by the bombs farthest from the target, the ones effected by accumulated errors. In practice, to eliminate the unavoidable loose bombs the bombing pattern is usually calculated from 70 per cent. of the bombs and called the 70 per cent. zone.

In the above examples the patterns will be elliptical because in the first case the total range error is greater than the line error and in the second case less. If all the bombs are dropped with the same wind vector error, the pattern will be bounded by the maximum range and line errors, and offset from the aiming point by the distance represented by the wind error.

There are, in practice, other causes of errors which add to those above, such as the inaccuracies of the actual bombsight used, variations in bomb-ballistics, instability of an aircraft as a bombing platform, and the simple human limits to the ability of the crew to sight the target and fly the aeroplane precisely. During the war such figures as those above would have been considered very good bombing.

Two types of high-level bombsight were used by Bomber Command: the Mark XIV, which

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was a vector sight, and the S.A.B.S. Mark IIA, a tachometric sight. Both had advantages and limitations, and due to the different principles which they employed, the vector and the tachometric, their principal causes of inaccuracies differed. Different techniques had to be used to obtain the best results from each: for example, the S.A.B.S. calculated drift and ground speed without a wind setting, but the Mark XIV required the wind from an external source.

It is convenient first to consider each sight separately and then compare them in use. Experience of both during the war made it possible to compare these sights in particular, and the vector and tachometric principles in general, for accurate bombing.

Mark XIV Bombsight

The Mark XIV was designed specifically to the requirements of crews engaged in night operations against large targets, who knew exactly what they wanted from the new bombsight which was to replace the obsolete Mark IX and the useless A.B.S., and it fulfilled the requirements admirably. It is still the most advanced vector sight known. The sighting head was gyroscopically stabilized in roll: the aircraft's height, airspeed and heading were automatically and continuously fed into the sight: the bomb-aimer had only to set the height of the target and the bomb trail angle before taking off and the wind over the target before bombing. The sighting head would then indicate at any moment, whatever the attitude of the aircraft within limits, the point on the ground on which a bomb, released at that moment, would strike.

The claim was made for the sight, based on this automatic setting of the vectors and the stabilized sighting head, that it gave the pilot great tactical freedom and that bombs could be aimed and released while the aircraft was diving or turning. This is still stated in tactical and bombing publications.

This is a fallacy, due to confusing the problem of hitting a selected target, which the bomber crew must solve, with that of knowing where a bomb released at any particular moment will strike. The sight solves the bombing problem in reverse: it indicates where the bomb will fall; the crew require to know where to steer the aeroplane and when to release the bomb to hit a preselected point, and they must obtain from the bombsight this information which the Mark XIV or any other vector sight does not directly provide.

A short account of the process of bomb-aiming with the Mark XIV is necessary to explain this. The sighting graticule is a cross with one long arm pointing towards the target. This arm is the drift line, which is crossed by the release line. As the aircraft approaches the selected target, the target disappears from the pilot's view beneath the nose of the aircraft, and he has to rely on the bomb-aimer's spoken instructions to enable him to steer the aeroplane so that the drift line picks up the target. The pilot cannot see the graticule or the target; the bomb-aimer's instructions cannot be precise. The only way the bomb-aimer can direct the pilot to turn the aircraft on to the correct heading is to instruct him to turn left or right as required until the target is running down the drift line. The corrections to be made become smaller and smaller as the target settles on the line; the pilot must have time to make these small precise turns, and because the bomb-aimer cannot tell him exactly how many degrees to turn, the procedure is one of trial and error. The target must be running down the drift line several seconds before it reaches the release line, so that the bomb-aimer can concentrate on releasing the bomb at the exact moment when it does so, and during this period the pilot must hold the aircraft on its heading within a fraction of a degree.

If there is an error in the wind set on the sight the target will not track down the drift line but will drift off: continual corrections will be required to bring it back so that it eventually coincides with the intersection of the drift line and the release line at the moment of release. There will be a bombing error due to false wind: if the target does not coincide with the intersection at the moment of release an aiming error will be added.

An attempt to make the bombing run in a turn means that the bomb-aimer has to direct the pilot to regulate the turn so that the target eventually passes under the intersection of the graticule lines. If the rate of turn is at all high this is impossible to judge, and the task is made more difficult by the fact that as the aircraft heading is changing the drift and ground speed are changing also, and the graticule is itself moving relatively to the aircraft. It is impossible to bomb accurately in this way.

It is possible to bomb by the normal procedure in a shallow dive: the sight will automatically make the necessary calculations for changes of speed and height. Any change of wind at different levels will not, however, be taken into account, so a wind error will result.

The result of experience with the Mark XIV on operations and practice bombing showed the necessity of precise flying to obtain accuracy and it also became apparent that accuracy

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depended ultimately on wind finding: the other factors could be reduced with care to give a certain maximum total error, and any wind error would be added to this. Squadrons which were engaged on precision bombing with the Mark XIV had to devote particular attention to wind-finding, usually by employing picked crews with special equipment to find and broadcast the wind.

A summing-up of experience with the Mark XIV during the war from the point of view of accuracy, amounts to this. It was good for targets as big as towns, just adequate for railway yards, but not accurate enough for smaller targets. It was not a precision instrument, the calculation of the sighting angle from the data fed into the sight was not precise, there was no correction for cross trail, the timing of bomb-release depended on the bomb-aimer's judgment, and the pilot, not provided with any visual guide, had to steer the aeroplane on the bomb-aimer's instructions and the directional gyro, which was not sufficiently sensitive for accuracy.

S.A.B.S. Mark IIA

The S.A.B.S. was made by suspending the original automatic bombsight in gimbals and adding a gyroscopic stabilizing unit. The resulting instrument was bulky. Most types of tachometric bombsights have a stabilized optical system and the mechanical part of the sight is removed from blocking the bomb-aimer's view. The first version of the S.A.B.S. produced poor results because the pilot was provided with no visual indication of direction and had to depend entirely on the verbal instructions of the bomb-aimer which could not be sufficiently precise to indicate the fine changes of heading required.

The addition of the Pilot's Bombing Indicator was a great improvement and made the S.A.B.S. Mark IIA almost as accurate as the American Norden but easier to use. The Norden Sight is interconnected with the automatic pilot so that the bomb-aimer's movement of the line (or drift) control steers the aircraft under automatic control. The S.A.B.S. was not designed for automatic control, but a pilot, by accurate flying, can follow the Pilot's Bombing Indicator, which is connected to the line control, in the same way as the automatic pilot follows the line control of a Norden.

A human pilot cannot fly as accurately as an automatic pilot: the S.A.B.S. is therefore less accurate than a tachometric sight connected to an automatic pilot, which is the most accurate type of bombsight, but it is a precision instrument capable of close grouping. The results obtained with it depend entirely on the crew.

The first step in the bombing procedure, as for any tachometric sight, is to obtain correct figures for the altitude and trail angle of the bomb. This is not always simple. The normal aneroid type altimeter must be set to the Q.F.E. to measure height above the ground. The Q.F.E. of a target can only be obtained from the meteorological forecast of the behaviour of the pressure distribution, which may change before the target is reached. In addition, the instrument reading will probably require correction for instrument error and temperature. The combination of Q.F.E. and other errors may amount to 300 ft.

During the war, height measurement for bombing precision targets with the S.A.B.S. was obtained by altimeters calibrated by the R.A.E. In addition, for long-range targets a direct-reading, radar altimeter was used to check the Q.F.E. The radar altimeter could seldom be used during the actual approach to the target unless it was over water or very flat country, because the reading varied with the undulations of the ground beneath; in mountainous country it was useless. A spot reading could nearly always be taken, however, at some point on the route near the target, and the aneroid altimeter, thus checked, be used for the actual bombing run. A radar altimeter can be valuable when the height of the target is not known, in unsurveyed country: a dummy run can be made over the target to obtain a spot reading, and the aneroid altimeter used to maintain this height. A radar altimeter is to bombing what the rangefinder is to gunnery.

Trail angle varies with air speed: the faster the airspeed at which the bomb is dropped the greater the air resistance to its forward travel and the more it will trail behind the aircraft. The best figure to use for any particular type of bomb is found by plotting the results from the air photographs of all those dropped. Errors in height and trail angle settings both cause under or overshoots: to eliminate a systematic trail-setting error, therefore, the measurement of height must be accurate. If this can be assured any tendency of the bomb pattern to over or undershoot, plotted from as many operations as possible, can be corrected by an adjustment of the trail setting used.

If correct settings of height and trail are made, the distance the bomb falls from the aiming point depends on the ability of the bomb-aimer to manipulate the bombsight controls and of the pilot to fly the aeroplane accurately: there are two points of technique, however, which simplify the crew's task and make good results more certain. The first is selecting the aiming point and the second is pre-setting the wind on the sight.

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The graticule of a tachometric sight holds the target during the bombing run: the bomb-aimer aligns the graticule on the target and manipulates the controls to adjust the speed of rotation of the sighting head so that the graticule remains steady on the target. If the aiming point is not a sharply defined mark the bomb-aimer cannot judge an exact point on the ground on which to fix the graticule, and in wandering over an area it will feed false information into the sight. To take an extreme case, it would be difficult to hit the centre of an open field by aiming at the centre; the better method would be to approach diagonally, aim at one corner and use a false height setting to produce an overshoot into the centre. It is impossible to aim at a target obscured by the smoke of previous bombing. In planning an attack a sharply defined aiming point must be selected, and special attention must be paid by tactics or timing, ensuring that some aircraft are not presented with a target obscured by the smoke of earlier bombs. It is impossible to bomb accurately by aiming at a cloud of smoke with a tachometric sight.

A fairly accurate wind found before bombing, by navigation or other method, is a great assistance to accuracy, especially if the wind is high. Although the sight calculates its own wind during the bombing run, this takes time if zero wind is set, and a longer run is required while the correct drift and ground speed are accumulated on the sight. If the original setting is fairly accurate the bomb-aimer has only to make the final fine adjustments to lay the graticule on the target, the pilot has only one or two small turns to make, and a good steady run-up to the target results; also, if the initial settings are fairly accurate a bombing run of twenty seconds is ample, which means the bomb-aimer does not have to identify the aiming point from so great a distance, an important consideration if the visibility is obscured by haze or sun.

The settings are actually made in the form of groundspeed and drift which entail calculating them from the airspeed heading of approach and wind: the heading of approach is part of the planning of the attack, and the airspeed is known from experience, normally the speed of the particular aircraft flying with open bomb-doors at maximum climbing power.

The most important aspect of flying technique for accuracy is maintaining constant height and airspeed during the bombing run after the sight has been switched on. The height is the more important; this must be the height which has been set on the sight, and it should not vary more than about 30 ft. during the run, which is well within human capability with all existing bomber aircraft. Variation of height during the run causes the sight to calculate a false ground speed. If the height is not varied the aircraft will automatically maintain a constant airspeed.

To sum up, therefore, the technique evolved by 617 Squadron, the only squadron equipped with the S.A.B.S. IIA, was as follows. In planning an attack the direction of approach was decided, taking note of the gun defences and ease of locating the target from landmarks. The aiming point was selected; by night a red-spot marker was used and not an air-burst marker, which caused too diffused an aiming mark. A few minutes before reaching the target, the height, drift and groundspeed were set on the sight. The bomb-doors were opened and throttles set to allow the aircraft time to settle down to its natural speed, and the engines synchronized to eliminate crabbing. Each aircraft would aim individually at the target, and to prevent the first bombs obscuring the target all aircraft endeavoured to bomb in the 25 to 30 seconds between the first bomb leaving aircraft and striking. This was possible with a small force by staggering the aircraft heights to prevent collision.

The constant height which has to be maintained during the bombing run is commonly advanced as a disability of the S.A.B.S. compared to the Mark XIV. That this disability is in fact of no account will be shown in the following comparison of the two sights in operations during the war.

Comparison between S.A.B.S. and Mark XIV Bombsights

The important difference between the two sights, and the one which makes the Mark XIV the better sight to use in certain conditions, is that to bomb accurately with the S.A.B.S. the bomb-aimer must have a clear-cut aiming mark on which to fix the graticule. He cannot aim at the centre of a cloud of dust or smoke or a conflagration. A large force of aircraft all using the S.A.B.S. would be handicapped because after the first bombs had struck, the target would be obscured and the accuracy of the sight discounted. Bomb-aimers using the Mark XIV could judge the centre of the smoke fairly well. This is an important factor not usually stated in manuals. The Mark XIV can be used to obtain approximate bombing in conditions when the S.A.B.S. cannot be used tachometrically at all.

American heavy bombers using tachometric bombsights flew and bombed in formation, so that only the leader of each group aimed at the target. But in Europe the Americans did not drop 1,000 tons of bombs in a single attack or use incendiaries in quantity, so that smoke

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blanketing the target was not a great handicap. Planning for tachometric bombing must always take into account the effect of smoke, however, although it can usually be circumvented by bombing downwind, spacing the aiming-points, or timing, provided that incendiaries are not used.

For small targets the S.A.B.S. was superior to the Mark XIV. It would reliably produce bomb-patterns half the size, and therefore four times as many bombs on the target as those obtained with the Mark XIV when meticulous care was taken to obtain an accurate wind. The advantage was the wind-finding facility of the tachometric principle which provided a degree of reliability which the vector sight could not, and it was made clear that the tachometric system is necessary for accurate bombing with unguided bombs.

The disadvantage of the S.A.B.S., compared to the Mark XIV, is so regularly stated to be that it requires a long straight bombing run at unvaried height, while the Mark XIV gives tactical freedom, that some space must be devoted to stating categorically and in detail that theory and practice during the war proved that for accurate bombing the fabulous tactical freedom of the Mark XIV had a negligible effect on the safety of an aircraft.

Bombing targets defended by heavy A.A. guns only will be considered. Defence by manœuvre against fighter attack must consist of such violent manœuvres that bomb-aiming is impossible, and the type of bombsight is therefore irrelevant. The captain can adopt these tactics, or fly straight, concentrate on bombing accurately and trust to his gunners. There is an inexorable choice to be made—attack or retreat. No compromise exists. Homing or guided missiles were not used during the war so there is no experience of them by which to judge, but one can assume that if a bomber could evade such a missile it would only be by a very violent manœuvre.

The guns defending a target will be sited to produce the greatest concentration of fire over the target, so that attacking bombers will be most heavily engaged during the bombing run. If the actual target to be attacked is not the centre of the gun-zone it is not the most important target in the area, and the main concentration of fire can be avoided by selecting the best direction of approach. The effect is that the target is less strongly defended, but the principle is not altered.

Whatever action the aircraft takes outside the gun-zone, where it will be out of range of most of the guns, to bomb the target it must head towards it, and for the bombing run it must be flown steadily. This is accepted for the tachometric bombsight, and it has been argued for the Mark XIV. For accurate bombing it must be flown straight during the 15 seconds before bomb-release. Even if accuracy is sacrificed with the Mark XIV during the bombing run by turning off the bombing heading, the aeroplane must turn back towards the target, and the resultant S-turn will displace the aircraft a negligible amount from its mean path. The beginning of the bombing run will usually coincide with the point where the aircraft comes within range of a large number of guns.

There remains the question of changing height by a shallow dive during the bombing run. Bombing with a tachometric sight requires adherence to an exact height. The Mark XIV allows the height to be varied. In fact, no experience of the war showed that there was any substantial advantage in the loss of height which the limits of the sight allowed. The later types of A.A. equipment fed height data to the guns almost continuously, and during the war the accuracy of A.A. fire was not high enough to make small changes in the aircraft's position in space worthwhile. The loss of accuracy resulting from the changed wind velocity when height is altered is a factor which must be set against the dubious reduction in casualties.

If in an operation of war the bomber crew, exposed to the dangers of the enemy and the weather during a long flight over enemy territory, do not during the vital 20 seconds which determine whether the target will be hit, put bomb-aiming above all, and do miss the target through bad bomb-aiming, then those greater dangers will have been incurred vainly. The target will have to be attacked again, and the risk thereby doubled.

During the war heavy A.A. was not a formidable weapon, although generally over-rated, because it was visible while the night fighter was invisible. Casualties from fighters were many times those from flak, especially if the last period of the war, when the German fighter force was impotent, is omitted. Heavy A.A. gunnery has approximately kept pace with aircraft performance, and was about as effective during the last war as during the previous one, but gained more success because heavily defended targets were repeatedly attacked. It is probable that the future will show the same trend, the advent of proximity fuses and more accurate tracking equipment being balanced by the greater distance from the target at which the higher- and faster-flying bombers will release their bombs. However inherently accurate the guns, there

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remains the difficulty of calibrating them for the great ranges at which they have to shoot. No gunner can shoot accurately without sighters.

The future seems to lie, however, with the homing or guided A.A. missile. It is too soon to judge its performance, but it is plainly a very potent threat to the very existence of the bomber. No weapon invented has ever realized its first expectations, however, and it may be that the bomber, as long as it is required, will be able to counter this one.

In comparing the S.A.B.S. and the Mark XIV the argument has been based on individual aircraft. By day, the classic bomber tactics are to fly in close formation for protection by concentrated fire power against fighter attacks. Bombing is then done in formation, the leader aiming at the target, and the rest of the formation releasing bombs on his signal. In this case, evasive action against A.A. fire is not possible because it splits the formation. A tight formation provides A.A. with its best target. All the guns are concentrated at the same target, and bursts anywhere in the formation will damage aircraft. The vulnerability to A.A. fire is accepted for the protection against the greater menace of fighter attack. This technique of pattern bombing has implications as regards bombing accuracy, and as all American bomber operations in Europe used this technique direct comparison is possible with that of Bomber Command's individual aiming.

Pattern Bombing

Practically all bombing has the object of laying a pattern of bombs, but "pattern bombing" is the standard term for bombing in close formation. The formation leader aims at the target and the other aircraft release their bombs on his signal, without aiming. The resultant bomb pattern is effected by the size and type of the formation, and is more openly spaced than that produced by the same number of aircraft flying and aiming their bombs individually. The spread of the pattern in the direction of flight can be reduced by each bomb aimer sighting for range and releasing independently, but the spread across the line of flight cannot be reduced: the width of the formation is the minimum width of the pattern, and, in fact, as the formating aircraft are not flying exactly parallel courses to the leader at the moment of release the spread will be much wider. The larger the aircraft and the greater their speed and height the further will the pattern spread. Against small targets such as bridges and ships this method is extremely wasteful because the centre of the pattern is not dense enough to ensure a hit.

The comparative effectiveness of day and night bombing, represented by the methods of the U.S. Army Air Force and R.A.F. Bomber Command respectively, is governed by this factor. In clear weather at night, if a target can be accurately marked, a force bombing individually will achieve a denser pattern than by bombing in formation by day. The qualification "accurately marked" is important. If this is not possible, because the radio equipment is inadequate or the target cannot be found by a visual marker crew, the daylight force will do better than the night; but by 1944, Bomber Command could mark targets with certainty in clear weather and, against such targets as synthetic oil production plants, could achieve a concentration to put a plant permanently out of action, whereas an American daylight raid could cause only temporary damage. If the target is covered by cloud, so that blind bombing by radio is necessary by day or night, the situation is reversed. The close formation daylight force will achieve the same concentration as in clear weather, and if the leader is directed by an accurate system such as Oboe will have the same order of accuracy. A night attack above cloud by Oboe, using parachute marker flares, will be inferior because a flare floating downwind at 30 knots or faster is not an accurate marker.

Bombing a small target in clear weather, a small force in loose formation with aircraft aiming individually is more likely to succeed than a large force bombing in formation, especially if the target is strong and heavy bombs are required.

It may be that in daylight enemy fighter strength makes close formation necessary for defence; that is a tactical factor which over-rides the bombing one. If the raid can be escorted, however, it is probably more economical to increase the fighter force to the strength at which it can guarantee to cover the bombers over the target. The bombers can attack in open-formation, and by virtue of the greater accuracy obtained the strength of the bomber force can be greatly reduced. Bombers cost more than fighters and there is a law of increasing returns operating in this case, because the fewer bombers there are to protect the easier the escort's task.

These are some of the factors for and against formation pattern bombing. Their relative importance depends on circumstances, and for each operation they must be weighed to find on which side the balance lies. There is no rule-of-thumb guide to bomber planning.

The future of the tightly packed heavy bomber formation is, however, very questionable. It was created to supply, by concentration of fire, the

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defence against fighter attack which a single bomber, because of its weak fire power in any particular direction, could not provide for itself. It probably survived the war because the proper weapon to attack it never came into use, although it is now known that Germany was developing the heavy rocket missiles to destroy the Fortress formations against which cannon and machine guns had been unsuccessful. The fighter of the war, lightly armed and manœuvrable, was designed to fight another fighter, and not as a bomber destroyer. It is clear that the bomber destroyer, operating at short range, can always carry heavier armament than the bomber laden with its fuel and bombs, and should be able to engage the bomber formation outside the range of what armament the bombers can carry. The bomber formation is then one huge vulnerable target.

The history of land warfare points the way. When armies fought with the muzzle-loading musket they fought in ranks, shoulder to shoulder, to produce the necessary fire power, and evolved the rigid close formation manœuvres which are now seen only on the parade ground. The machine gun and the field gun expanded the battlefield, and each successive increase in fire power has caused a further dispersion, to reduce the vulnerability of targets to these weapons.

The heavy bomber formation as it is known today would probably be as vulnerable to the proper bomber destroyer weapon as the British Square to the machine gun, and as out of date.

The Main Lessons of the War

1. *Accuracy and Economy*

The great lesson of the war for a bomber pilot is that accuracy dominates bombing operations. Mathematical theory shows that the effect of an attack is a function of the square of the accuracy (if accuracy is expressed as the inverse of the average distance of bombs from the aiming point). During the war it became clear that against small targets theory was borne out in practice. Investigation after the war has shown that not only was this true for individual targets but it was true for the bomber campaign as a whole.

The implications of establishing this principle are far-reaching. Bombing accuracy depends on two processes: locating the target and hitting it. It is prodigality to build a large bomber force but neglect to provide the most accurate and versatile methods of bomb-aiming to function against all types of targets and in darkness and bad weather. The cost of the most elaborate systems and instruments for locating the target and aiming the bombs is a fraction of the cost of the bomber force. Improving the accuracy is the greatest single factor for reducing the cost of a bomber offensive, by reducing the size of the force needed for shortening the war.

If the potency of a bomber formation is increased by an improvement in accuracy the number of aircraft required to destroy a target is less and casualties reduced. The only true criterion of bomber losses in an operation is the comparison between the aircraft lost and the damage done to the enemy. Losses expressed as a percentage of the number of aircraft dispatched can be misleading: 1 per cent. lost on an operation which fails are added to 1 per cent. (or more) on a repeat attack, and perhaps again and again until the total loss is far greater than that of a small force which loses a high percentage but destroys the target. The nation can build each day so many aircraft and train so many crews. The bomber force can lose each day up to that number. It makes no difference whether they are lost as a low percentage of a full-strength attack or a high percentage of a small force; what is important is that the loss of those aircraft and their crews, out of the dwindling reservoir of the nation's young men who are physically and mentally capable of manning the aircraft, should purchase their value, in war's grim market, of damage inflicted on the enemy's strength.

Since it first appeared, the bomber aircraft has grown steadily in size and cost and the trend continues in that direction, impelled by the need for greater range, heavier weapons and economy in pilots. The heavy bomber crew must hit their target: it is futile to throw away accuracy for a questionable increase in safety at the climatic moment of the raid, that of releasing the bombs. Bombing accuracy must not be subordinated to defensive tactics: tactics must be planned round the intention to hit the target, and if the result is prohibitive casualties, new methods or equipment must be devised.

The more powerful the bomber's weapons become, the more, not less, is accuracy important, because the greater is the proportion of the nation's war effort expended in a single attack. The most powerful weapon of the present, the atomic bomb, is very expensive, and due to the prodigious process of refining the crude ore to obtain the quantity of the required isotope to make one bomb, will continue to be so. An atomic bomb has a certain radius of destructive power, a pattern in fact, and must be accurately placed to obtain the maximum effect.

Finally, on the subject of accuracy and economy, two examples of the war can be quoted.

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The first is the German oil plant at Leuna. This was repeatedly attacked throughout the war, and it has been calculated that altogether 85,079 tons of bombs were released against it, of which 8,643 tons fell within the boundaries of the complex. The target area was not large, compared to a city, but it was as large as the danger area of the normal practice bombing range. Weather was of course a large factor which acted against accuracy in combination with the fact that the target could not be located by radar until France was liberated.

The second example is the sinking of the Italian battleship *Roma* by the German Air Force after Italy capitulated, on 9th September. The ship was proceeding from Spezia to Malta in company with cruisers and destroyers, but without fighter cover, when it was attacked by five Heinkels with "Fritz" radio-controlled rocket-propelled bombs. It is not known how many hits were scored, but the ship blew up, broke in two and sank quickly. None of the aircraft were shot down, and in fact they scarcely came within range of the A.A. fire of the fleet. That operation was a model of economy, through accuracy.

2. *Planning*

The second main lesson of the war is the importance of planning a bomber operation in detail from reliable data. The target must be examined first, the number and type of bombs required to hit it calculated, and then from the accuracy which can be achieved with the methods available the size of the bomber force determined. It is useless except in the most desperate contingencies sending whatever is available and trusting to luck. Aircraft are lost, targets are not hit, and the morale of the crews falls. Bombing is a matter of mathematics, and when the calculations are made the great element of luck which is always present can fall as an occasional bonus, but sufficient precaution should be taken to prevent the bonuses being cancelled by deficits.

In pursuing the development of bombing technique the two aspects, bombing accuracy and planning, are complementary components of it. Equipment, tactics and training must be constantly improved, and the analysis and recording of results so maintained that the capabilities of the bomber force can be calculated reliably. One of the most important results of such an analysis will be the revealing of inabilities, which will stimulate the development of methods to overcome them. This is as important in peace as in war, so that if war suddenly breaks out the bomber force is not ordered to undertake tasks it cannot perform, or fails because unforseen deficiencies are revealed by the crucial test.

But the history of the bomber offensive points the lesson of making the most of the equipment available, which is not strange because it is contained in the whole history of war and is illustrated by the long list of battles won against superior odds.

This is probably the most important lesson of all, and one which has had to be regularly relearned as after each war in our fighting history, concluded by victory with strong armed forces and numerous allies, we have entered the next weak and almost alone, but with the memory of the final phase of the last one influencing our tactics. It is possible now to look back on 1940 and see how, with the experience of the war, bombing results could have been better than they were, with the equipment there was. Visual marking of targets by low-flying Mosquitos was conspicuously successful in the last phase of the war. In 1940 there existed the Blenheim, adequate for the purpose. It was possible then to make full-scale raids in full moonlight. There were experienced pilots who could find the easier important targets and could have marked them. Fairly accurate results were possible with the Mark IX bombsight with attention to the primary points of bombing theory, by aiming at a clear mark, and with less attention to the inaccurate A.A. fire. It is now clear that in training for the approaching war there was insufficient attention to the primary problem, that of locating the target at night, insufficient experiment on bombing methods with existing equipment, and insufficient analysis of what was possible.

There is now the danger under the influence of the last phase of the war which was won with tremendous superiority of numerical strength in the air and the profusion of technical devices, particularly in the field of radio, which the bombers used, of losing sight of the fact that planning and tactics made it possible to make the best use of every item of equipment. Right up to the end of the war improvements in tactics were being evolved in the constant search for greater accuracy. There was no device which worked automatically on the pressing of a button, and there never will be. The more complex an apparatus the more care must be devoted to obtain the best results, and the better it will repay ingenuity and skill. Tactical training is putting an edge on the sword and without this sharpening it is unfit for battle. There is a moral for the future. The coming of peace has slowed up technical development, but there is no reason why tactical development should be retarded to the same degree. At the very end of the war the demand was for greater accuracy which post-war

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analysis has supported. The immediate sources for filling this demand, before revolutionary new equipment is produced, are the fields of tactics and training.

FUTURE DEVELOPMENTS INDICATED BY THE WAR

As far as can be seen the future divides itself from this present viewpoint into three main phases. The first is the immediate post-war period in which the threat of a major war is not great because most of the world is struggling towards economic recovery. Bomber Command, reduced to a fraction of its war establishment, is still equipped with war-time aircraft, now obsolete. The second period will open when the new aircraft appear, jet-propelled, with a performance of the order of 10,000 miles range, 500 knots cruising speed and 45,000 feet ceiling. This period will not open for at least five years unless precipitated by an impending crisis. The third period is that of the long-range missile, rocket or winged projectile, which will eventually supersede the bomber as the main long-range striking weapon although it may not totally delete it for a much longer period. The perfection of a long-range missile can only be guessed at, but ten years is probably the shortest time.

The post-war period, in which we are at present, raises the questions of how the small bomber force is to be trained, what tactical doctrine is to be adopted and what standard of capability is to be expected of it. The war, with its formidable achievements, is still so close that it tends to exert too great an influence on planning. Circumstances have changed since the war ended and are still changing rapidly; it is a return to peace-time, but not the peace of before the war. The political equilibrium of the world is a different arrangement of the Powers and our strategic commitments are different.

In considering the next stage of the future, the introduction of the prospective new aircraft and new weapons produces a number of formidable problems in bomb-aiming which are obvious now. Others will doubtless present themselves when the aircraft come into service. Accurate bombing with unguided bombs will be difficult from an aircraft flying at 600 m.p.h. at 40,000 ft. The target will be about seven miles ahead at the moment of release, so that very precise alignment of the aircraft on the correct heading will be necessary; it will be difficult to locate a target by eye far enough away to make a bombing run; the aircraft will have a large radius of turn so that it will be necessary to make an early turn on to the correct heading; in practically all parts of the world the ground is frequently obscured by haze to oblique vision from this height, or is cloud covered. Apart from these aiming difficulties there is the problem of the behaviour of a bomb released at near-sonic speed, and when an atomic bomb is used that of delaying it until the aircraft is clear of the danger area.

The possibility of using the atomic bomb does not diminish the importance of accuracy. One atomic bomb is a very expensive item and will be so for a long time to come. The output of atomic bombs will be limited by industrial capacity to produce them; we are probably as far off producing atomic energy from non-radio active materials as the Athenians were from making an atomic bomb. Production rate will probably be the natural brake on the potency of the bomb as a decisive weapon. Costly and scarce, each bomb must pay a dividend by destroying a strategic target. The power of the bomb is not unlimited and it will be as necessary to place it in the selected aiming point as it was to centralize the bomb pattern of a mass raid in the last war.

One of the natural reactions to the advent of the atomic bomb will be dispersal, under threat of war, of everything vulnerable which cannot be put underground. Armies, storage depots, factories, human beings, will be dispersed evenly in small units instead of being concentrated in cities and congested areas. This process was started by high explosive and will be pushed forward another larger step. The result will be that profitable atomic bomb targets in a country organized for war, and we can expect no other sort of enemy, will be fewer. The main strategical targets, oilfields, coalfields and metallurgical plants cannot be much dispersed, but there will be a multitude of targets which the bomber force will be called upon to attack for which high explosive bombs will be economical. To use an atomic bomb to destroy a bridge would be using a large steam hammer to crack a walnut.

The aspect of bombing in this visualized war of the future which stands predominant is locating the target to aim at it—the great problem of the last war rising again. Most of the methods of the last war will not work in the new conditions: targets will be beyond the range of the ground-controlled systems like Oboe and G.H., and visual location from high altitude will not be reliable. The weather cannot be permitted to be the controlling influence it was over the comparatively short range operations of the last war.

H_2S and similar equipments have strict limitations. The first is its power of discrimination. On a wavelength of 3 cms. the presentation will show coastlines and large rivers well, small towns fairly well. The shorter the wavelength the

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better the presentation, but as the frequency approaches that of light the radiation behaves more like light and at shorter wave lengths than about 1½ cms. is reflected by cloud. It seems therefore that the limit to H₂S has been reached. Discrimination can be improved by using shorter wavelengths but at the expense of all-weather performance, which nullifies its value except for special occasions.

H₂S in its present form, using a Plan Position Indicator, is not an accurate bombing device. The technique of bombing with this equipment consists of measuring the bearing and distance of the target, tracking towards it by steering a course calculated by the navigator from the best wind available, and releasing the bomb at a precalculated distance from the target. It is in effect bombing by the time-run method: the crew are provided with the same information they would, in clear weather by day, obtain from the map. The timed-run method is not accurate bombing because the reference point is not the target but a point at some distance from it, and once the bombing run has been started the only check on deviations from the precalculated heading is the pilot's compass. When H₂S is used errors are introduced by the poor discrimination and the distortion of the P.P.I.

The unsuitability of P.P.I. presentation for feeding data into a tachometric bombsight computor leads thought towards the possibility of using a fine "pencil"-beam which could be locked on to the target. The measurements of the azimuth and depression angles and the range could then be fed into a tachometric computor and the automatic pilot. The beam would replace the bomb-aimer's vision and would also measure altitude, as a function of the slant range and the angle of depression.

The practical difficulty is that of locking the beam on the target. It would function on a ship at sea or similar target giving a good response, but the normal inland target would not hold the beam. The same disability would apply to homing bombs, whether thermal or radar: the target could not be relied upon to provide a response which the homing device could discriminate from that of the surroundings, and in fact there could easily be some object producing a stronger response to attract the bomb away from the target. The possibility of artificial responses as decoys to protect targets is evident.

The remote-control-guided bomb offers possibilities. Both the target and the bomb must be observed for radar to be used at night or in bad weather. A radial scanning beam, movable horizontally and vertically, could be used. The operator would pick up the target, and the presentation would then show sufficient of the surrounds for him to select the aiming-point. The bomb would be constructed to guide itself down the centre of the rotating beam, and by controlling the beam so that the aiming point was held in the centre of the presentation tube the bomb would be guided to the target. This is a development of the German radio-controlled bombs, replacing the bomb-aimer's vision with a radar beam.

All methods of blind-bombing from high altitude depend, however, on the equipment being able to "see" the target. The vital targets will probably be the most difficult ones. If we are involved in another war it will be because the enemy has prepared for it, and he will not leave vital targets exposed. The aim of our bomber force must be the ability to hit in any weather the vital point of any target, even though it is only represented by a point on a map or photograph.

It is difficult to avoid turning to target marking as a solution, although it savours of a retrograde step. Target marking has all the disadvantages of complication. The bombing aircraft have to depend on an outside organization instead of being self-sufficient; there must be synchronization between bombing and marking operations; there is the risk of failure of the marking system causing complete failure of the operation.

Nevertheless it does seem that the bomber must have an artificial aiming mark to hit a target at long range. Long-range radio aids, astronomical fixing systems or D.R. plotting by sensitive accelerometers may achieve accuracy of navigation of an order at present unknown, and place the bomber within reach or even sight of its target, but something else will be needed to hit it.

All the various bombing methods of the war had their own disabilities; every target had its own characteristics which one method suited best. There were many targets which were repeatedly attacked without success because there was no method or equipment good enough. It will be necessary to experiment with every device and method that can be devised because each will have its particular use.

The following are suggested requirements of bombing equipment.

The bombsight should be a tachometric sight connected to the automatic pilot, to be used for visual bombing or as a radar sight obtaining data from a lock-follow beam. The beam should be capable also of locking on to a radar responder-beacon used as a target marker or scanner to produce a circular presentation, and the scanner

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of being swivelled or depressed to follow a target.

A marking force will have to mark targets at low-level because it cannot do anything at high-level that the bombing forces cannot do for itself. It is assumed that targets will be out of range of ground-controlled systems such as Oboe. Low-level marking was dangerous in the last war and it is not to be expected that an increase of speed of about 200 m.p.h. will make it safer. The key to low-level work is surprise, and the greater areas of territory over which operations can be expected, compared to the last war, will make surprise easier to attain. The difficulty will be to obtain an aircraft of adequate range, equal to the heavy bomber's, of a reasonable size. The larger an aeroplane is, the more vulnerable it is.

The bombsight for the marker force should be primarily a radar set of very high discrimination for map-reading at low-level at night or in fog, with a computor into which bombing information is fed when the target is located. The high discrimination of the radar equipment will be made possible by the short range at which it operates, and this is the only reason for low-level marking when the ground is not visible. For daylight marking below cloud a visual bombsight for accurate shallow-dive bombing will be necessary.

Target indicator bombs should be of both pyrotechnic and radar types.

The factors involved in the future high-altitude, high-speed, bombing problem are so adverse to accuracy that it seems that some control of the flight of the bomb after release will be necessary. To depend entirely on guided or homing bombs for the aiming process does not, however, cover all contingencies. The problem of guiding a bomb from high altitude is that of locating the target. The target must be visible to the eye or the radio equipment. Discrimination is the limitation of radio equipment: only certain types of target can be seen. Similarly, a homing bomb can only guide itself to a target it can discriminate. A system of marking the target with some form of radio beacon on which the bomb will home itself offers promise, but there will be limitations to its use. It may not be possible to mark all targets (even if marking is possible at all from low-level, which is the only means seen at present of overcoming the difficulties of high-level bombing). All types of bombs may not be suitable for the incorporation of homing and steering mechanism. At present it seems that the best development policy will be to aim the bomb as accurately as possible from the aircraft and use the homing or guiding to improve the accuracy. The less correction the bomb is going to require in flight the smaller and simpler will be the guiding mechanism which has to be built into it, and if a reasonable degree of accuracy can be obtained by straightforward bombing methods there is an independence of the more complicated systems when it is not possible to use them.

The weapon of the future is clearly one of the family of missiles, but what form it will take, winged or wingless, rocket turbo-jet or thermo-duct propelled, or how soon it will appear it is too soon to judge. When it becomes a reality the bomber will lose its position as the long-range weapon. It may still be useful, even necessary, for certain purposes, but the missile will be less vulnerable to the enemy's defences and cheaper if it can hit the target.

The British Isles is a small, compact, densely populated area whose vulnerability to bombardment by long-range missiles must cause anxiety to everyone conscious of the present political antagonisms threatening the future. Defence against such attack is not to be achieved by passive measures (although dispersal, deep shelters, measures against bacteria and radio-activity, and interception of the missiles, will be important palliatives), but by striking hard, immediately and accurately, at the source. Britain is small and missiles will find targets almost everywhere. The enemy will be large and targets widely spaced. To paralyse the enemy's striking power before he has inflicted mortal damage, those targets which are the source of his bombardment must be knocked out, to gain time for the strength of the Commonwealth and our Allies to be gathered for the counter-attack. The United Kingdom will not in the future be able to stand behind the defence line on the cliffs of Dover, which has been held for centuries, first by the Royal Navy and then by Fighter Command. The first line of defence will be the long-range striking-force which must have the power, range and accuracy to hit its targets. Whatever the weapon it must fulfill these conditions, and the rocket must possess the quality of accuracy before it can accept the responsibility of the bomber guided by human eye and human brain.

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The Air Ministry and Its Organization

THE Air Force (Constitution) Act of 1917 laid down that an Air Council should be established "for the purpose of the administration of matters relating to the Air Force and the defence of the realm by air." The Act gives the Air Council power to appoint, with the sanction of the Treasury, "secretaries, officers and servants"; and these are the various departments of the Air Ministry. In addition, the Meteorological Office forms part of the Air Ministry, although its work is, of course, much wider than supplying weather services to the R.A.F.

The Air Ministry is not merely the next higher formation after a Command. It is the point at which Air Force policy and administration become part of Government policy and administration generally. For this reason its head is a Minister, who is a member of the Government and answerable to Parliament; it also means that its organization is rather different from that of an Air Force headquarters.

The Air Council

The Secretary of State for Air is President of the Air Council and the Parliamentary Under-Secretary its Vice-President. The other members of the Air Council are the Chief of the Air Staff, the Air Member for Personnel, the Air Member for Supply and Organization, the Air Member for Technical Services and the Permanent Under-Secretary of State; and two additional members, the Vice-Chief of the Air Staff and the Controller of Supplies at the Ministry of Supply, who is a serving officer of air rank.

The Secretary of State

The Secretary of State is responsible to Parliament for all Air Ministry business. He discharges this responsibility by presenting Air Estimates, by answering questions in Parliament and by explaining and defending his department's policy whenever necessary. Similarly, he presents the Air Council's policy to his ministerial colleagues —in particular the other Service Ministers and the Minister of Defence—and, through the Defence Committee, to the Cabinet.

The importance of the Secretary of State in the organization of the Air Ministry rests not only in his function as ministerial spokesman—what may be termed the outward channel—but in the control and direction he exercises as the Minister of the Crown responsible for the Air Ministry—the inward channel. The administration of the Air Force is at once the responsibility of the Secretary of State and also, under the well-known constitutional concept, the collective responsibility of the Cabinet. It is essential that the policy of the Air Ministry should be in line with Cabinet policy for the country as a whole; and in its most important aspects its policy is dictated by the wider policy in that the money, manpower and industrial capacity which are allocated to the Air Force are matters of Cabinet rather than departmental decision. The Secretary of State has to see that the policy of his department both makes the best use of the resources allotted to the Air Force, and is in line with the general policy of the Government of which he is a member.

The Parliamentary Under-Secretary of State is his deputy in these matters.

The Chief of the Air Staff

There is a further link with the Defence Committee and the Cabinet through the Chief of the Air Staff, in his capacity as a member of the Chiefs of Staff Committee. The latter is responsible for preparing strategic military plans and submitting them to the Defence Committee; and, to quote from the White Paper on the Central Organization of Defence (Cd. 6923), "it is essential that the Cabinet and Defence Committee should be able to have presented to them directly and personally the advice of the Chiefs of Staff, as the professional military advisers of the Government."

The Chief of the Air Staff also bears a co-ordinating responsibility. He is, by definition, "the first and Senior Air Member of Council and principal adviser of the Secretary of State in the direction of the Royal Air Force." He is therefore made aware of any important question of Air Force policy in whatever department of the Air Ministry it may arise. The administration of the Air Force can thus be related to a single Air Staff policy, aimed at maintaining the force in the highest state of efficiency.

Organization

The Air Ministry is organized under the Air Council in five departments. The main responsibilities of these departments are as follows:

Department of the C.A.S.

Air Force policy and planning; fighting efficiency of the R.A.F.; direction of air operations; ground defence; operational requirements; intelligence; and flying and general service training.

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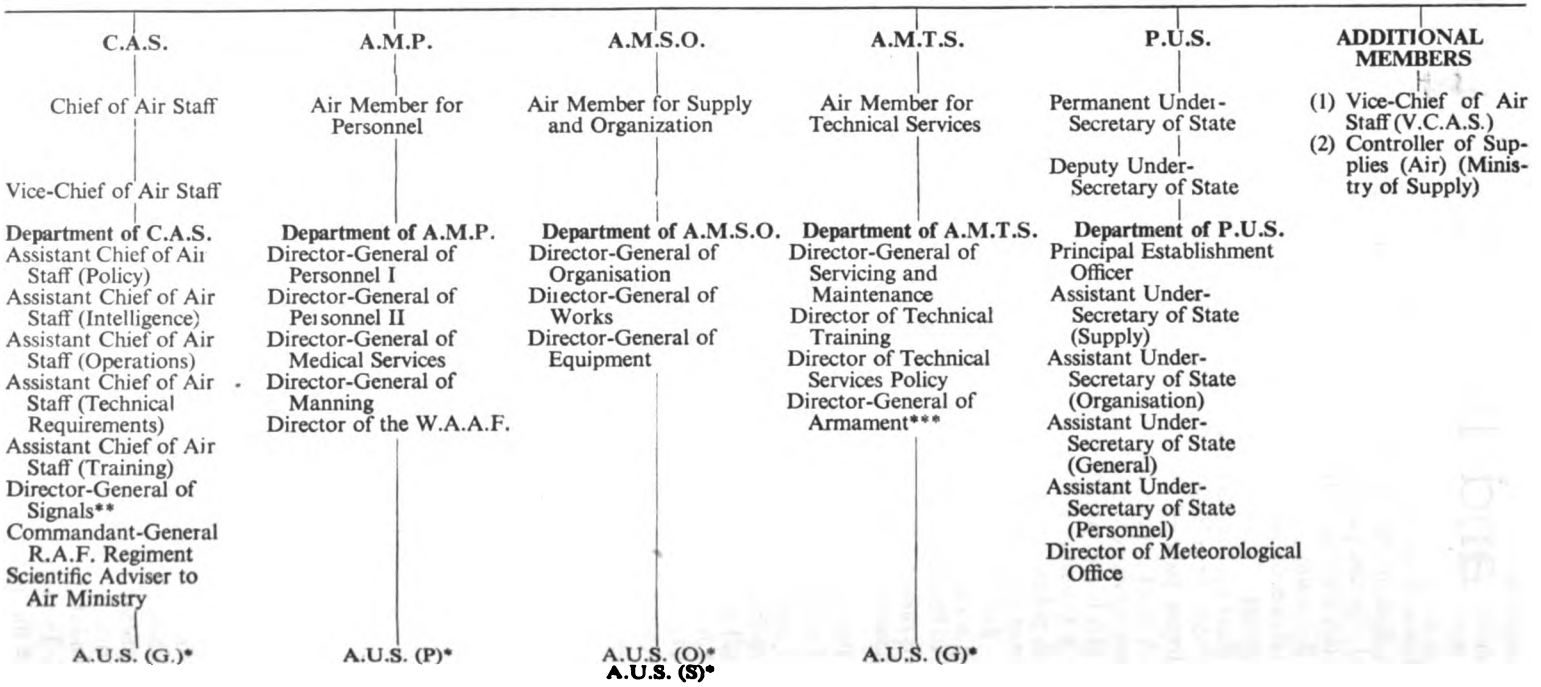
ORGANIZATION OF THE DEPARTMENTS OF THE AIR MINISTRY

SECRETARY OF STATE FOR AIR (S.of.S.)
PRESIDENT OF THE AIR COUNCIL

PARLIAMENTARY UNDER-SECRETARY OF STATE FOR AIR (U.S.ofS.)
VICE-PRESIDENT OF THE AIR COUNCIL



NOTE.—* See also under Department of P.U.S. ** Reports to A.M.T.S. on technical signals matters. *** Reports to C.A.S. on tactical armament matters.

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Department of the A.M.P.

Personnel; the manning of the Services; conditions of service; appointments; promotions; postings; casualties; welfare.

Department of the A.M.S.O.

The organization of the Royal Air Force; the provision of equipment, stores and food; transportation; works, buildings and land.

Department of the A.M.T.S.

Technical training and the technical aspects of armament, signals and engineering.

Department of the P.U.S.

General conduct and co-ordination of Air Ministry procedure and the conduct of the official business of the Air Ministry; control of expenditure, contracts and accounts; establishment of civil staff; Parliamentary and legal business; public relations; administration of the Meteorological Office.

It will be seen that the broad division of functions has many features of similarity with that of a Royal Air Force headquarters although there is a major difference in the inclusion of the Department of the Permanent Under-Secretary. This is because it is from the Air Ministry that the finances of the Royal Air Force are controlled, and because, as has been explained, it is at the Air Ministry that Air Force policy is integrated with Government policy generally. It is also at the Air Ministry that its relations with other departments, with the general public and with Parliament are dealt with. These matters, and the co-ordination of business within the Air Ministry, are the special responsibility of the Permanent Under-Secretary.

The chart shows how Directors-General and other senior officers are grouped under the Members of Council.

The Air Ministry is necessarily a large organization. Its headquarters staff currently numbers about 9,000, comprising 1,200 serving officers and 7,700 civilians. Of the civilians 5,200 are in the Department of the Permanent Under-Secretary and 2,500 in the departments of other Members of the Air Council.

With an organization of this size, efficient staff work is particularly important; casual and irregular methods, even in such minor matters as the arrangement of files, are liable to slow up the work. With its very large expansion in the past twelve years the Air Ministry has completely outgrown its buildings. Adastral House, which used to house the greater part of the staff, now only contains a fraction, and the Air Ministry has had to be split over more than thirty different buildings in London, to say nothing of its outstations in the provinces. This naturally results in delay and in staffs getting out of touch with each other. An efficient staff officer in the Air Ministry has to have a constant sense of urgency, a will to co-operate and to understand problems outside his own field, and has to be ready to give his mind not only to the problem of what should be done, but to the much less interesting problem of how to get it done and done quickly. He knows, however, that it is on Air Ministry policy and administration that the efficiency of the Royal Air ultimately depends.

Essay Competitions 1947-48

A REMINDER

We would remind all competitors that the closing date for the competitions is 31st May, by which date essays must be received to be valid.

All essays must be sent by *registered post*, addressed to The Editor, R.A.F. QUARTERLY, c/o D.S.T., Air Ministry, Richmond Terrace, Whitehall, London, S.W.1, and clearly marked on the envelope "R.A.F. QUARTERLY Essay Competition."

Full details and rules of the competitions were published on page 210 of the October, 1947, number of the R.A.F. QUARTERLY.

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The Planning of Air Defence
As applied to small Continental Countries

By Squadron Leader H. R. Allen, D.F.C., R.A.F.

R.A.F. Adviser on Air Defence to a small Continental Country

INTRODUCTION

IT is difficult for us in Britain to appreciate the problems which have to be faced by small continental countries which desire to form a system of defence against air attack. As the pioneer of radar, we were naturally the first nation to establish a system of any efficiency. That system, proved during the Battle of Britain, has been modified and improved out of all recognition by the ever-changing requirements of war.

Imagine for a moment the United Kingdom stripped of its operations rooms, radar network and its complicated system of communications; without its aircraft and equipment; without its officers and other ranks having the operational and technical knowledge acquired during the din of war; even without its airfields. Then the magnitude of the task of so many nations which ask only to be allowed to form their defence will be better appreciated.

In Britain, the Service Estimates have been drastically reduced. In many other countries the Services are fighting to be allowed any money at all for their formation and rehabilitation. Ministries have a bad habit of issuing the most fearsome warnings against the horrors of any future war, and then soon afterwards of allowing one-tenth the money asked for in the Estimates, whilst still expecting protection against such horrors.

In the building or rebuilding of air defence it is essential to realize one's limitations. Strategists will say that in defence, offence must rank high; that strategic attack will lessen the weight of attack that the enemy is able to bring to bear. The strategists will be right. But their argument must be confounded by the simple fact that many countries have neither the industrial potential nor the money to afford forces of defence *and* offence. They must, under such conditions, form the immediate requirement, which is an efficient fighter command with its raid reporting and control system.

Whilst foreign policy has a distinct bearing upon the formation of offensive or defensive forces, it is certain that no matter whether policy be for neutrality or military alliance, a show of teeth is always the best method of implementing either policy. And what better method of showing teeth than the display of an up-to-date, efficient fighter force under excellent control?

1.—DISPOSITION AND ORGANIZATION OF AIR DEFENCE FORCES

(*a*) *POLITICAL CONSIDERATIONS*

The immediate consideration is to gauge the task to be accomplished. Will the attack be the crushing of the steamroller of a powerful industrial nation the size of pre-war Germany? If so, will help arrive? If help arrives, whence will it come? And how long will the small country be expected to hold on till help arrives? It is after considering such problems that foreign policy is formulated. Discussions with military allies wll revolve around such likelihoods. And if these problems are well and truly faced, the consequent size and organization of the defensive air forces will be in accordance with true realization.

(*b*) *ESTABLISHMENT OF DEFENSIVE AIR FORCES*

The total manpower which can be made over to the Services from the overall total of the nation must be decided at an early stage by the Cabinet or its equivalent. This figure can then be argued by the three Services, each of which will not unnaturally want the biggest slice of the cake. At this stage, clear and unprejudiced thinking must be allowed full play by the Ministry of Defence or other over-riding authority. Tradition dies hard. And whereas comparatively few countries before the war possessed an air force worthy of the name, a large number possessed either an army or a navy justly proud of their tradition. The danger lies, therefore, in the liberal handing over of money and manpower to the popular army or navy and the possibility of treating the more modern air force in a miserly fashion. This would be done without full knowledge of the highly specialized and technical nature of a modern air force nor with the realization of its tactical and strategic importance. Such treatment, which does occur, makes one wonder whether the lessons of Warsaw, Rotterdam and finally Nagasaki have been truly taken to heart!

(*c*) *ORGANIZATION*

The primary phase in the building up of an air defence force is almost entirely concerned

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with the organization of technical training. It is worth realizing the great need at such a time for a friend or ally possessing a modern air force. If such a friend is willing to allow its small ally the facilities for training tradesmen and pilots within its organization, an important time gap will be filled and the small country will be able to begin its own internal organization with a nucleus of trained technicians and flying personnel. Such facilities would help the rebuilding of a shattered air force immensely.

(*d*) *COMPOSITION OF AIR FORCES*

Experience teaches that most small, war-ravaged countries are able to afford only the bare essentials of air defence. This usually confines the long-term requirements to a force of fighter aircraft. Here lies a danger. Painful experience in England has taught us the need for effective control from the ground of fighter forces. Consequently, we would ponder for a long while and bite our nails ferociously over having to make a decision, through lack of cash, to scrap either one radar station or, say, two fighter squadrons. A foreign Defence Minister, not aware of all the implications, might prefer the tangible asset of another squadron of fighters to a piece of radar equipment which costs almost as much by the time it is set up and land-lines are laid. He may well feel that his aircraft are at least a show of teeth, without realizing that such teeth, without proper control, may easily turn into rather brittle dentures when they are called on to bite!

(*e*) *EQUIPMENT*

Few of the smaller countries can hope to manufacture the multifarious equipment needed for an air defence system. They will have to rely, therefore, at least in the early stages, on purchases from a friendly power. This will detract, to a large extent, from their freedom of choice, as equipment supplied will, more likely than not, be of the types in standard use. Nevertheless, they can make decisions of the greatest importance. Will they, for example, purchase the most modern, jet-propelled fighters available, or will they be content with older types? The Air Chief with vision will aim for the best, even if the expense means limiting his rate of expansion in the early phases; for surely the smaller the country, the greater the need for fighters of the highest performance?

(*f*) DISPOSITION

The disposition of training establishments and later of operational units will at first be governed largely by the existence of airfields, whether built by occupying or liberating forces. The longer-term policy, however, will take into consideration the disposing of bases in relation to target areas and probable approaches, distances between bases, establishment of rear and forward satellites, dispersal of training establishments to "safe" areas, and so on.

(*g*) HEADQUARTER UNITS

The number and size of Headquarter units will vary with the size of the projected air force, the conformation of political and physical frontiers and the possession of colonial territories, if any. The chain of command will be influenced by decisions whether the air force should be a separate entity or a mere offshoot of the army. The attitude of the great powers will be closely studied when this problem comes forward for solution. The Royal Air Force is a shining example of the desirability of a separate air force and its obvious efficiency as such provides power for the ammunition of separate air force advocates. Another influencing factor is the recent decision of the United States to form a separate air force. Should the separate entity be not acceptable the formation of an air arm becomes a tedious and long-winded process for obvious reasons.

(*h*) *RESERVES*

The value of reserves trained on a part-time basis was conclusively proven during the Battle of Britain when the Auxiliary Air Force and the Volunteer Reserve worked so well with the nucleus of regular forces of the Royal Air Force. It is clearly impracticable for a small, regular nucleus to put up continuous resistance over a prolonged period of heavy fighting without assistance and reinforcement. For this reason it is most important to begin the planning of reserves at an early opportunity.

2.—AIR DEFENCE PLANNING

(*a*) *TERRAIN*

In the planning of air defence proper the first study should be of terrain. Such an examination should include notes on the limits of physical and geographic frontiers, contours, islands and rivers. The situation of centres of population and industry are of prime importance, as also are ports and other special dispositions, whether political or military. The mental picture gained by such a study should be carried when considering all aspects of air defence.

(*b*) *RADAR COVERAGE*

The ideal system of radar coverage would provide early warning outside the frontiers to the maximum depth allowed by the available equipment, combined with an overall, internal coverage giving sufficient "overlap" to allow the

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easy hand-over of interceptions by fighter control on the ground. "Overlap" means the amount to which one radar set "looks into" its neighbour's territory. Therefore, a target approaching the limit of sight of two neighbouring radar stations can be handed over by the one whose territory it is leaving to a neighbour into whose territory it is approaching. The depth of overlap, having allowed for the speeds of modern fighters, decides the time available for one station to hand over the responsibility of observation and control to its immediate neighbour.

To set up an efficient system the type of equipment must be selected which has the greatest range, together with height-finding facilities and low cover, and which is also capable of being used for Ground Controlled Interceptions (G.C.I.).

On a basis of the calculated range for the type of equipment envisaged at a mean height, it is possible by drawing circles of a similar radius on a scale map, after much trial and error, to plan the sites of radar stations. This will be done in such a way as to give maximum early warning combined with complete internal coverage down to a certain altitude, whilst still allowing the necessary overlap between G.C.I. stations. More stations designed to give forward cover or extra early warning can be fitted in outside the overlap, if required, without difficulty.

Then with a clear picture of the vital target areas and approaches in mind, and the position or planned position of airfields, it is possible to allocate areas of responsibility to each radar station, taking care not to give any station responsibility beyond its capacity.

It will now be possible to enter into chains of command and control. On the size of the system will depend the number of sector and/or group centres of control and the possible requirement of either a fighter command operations room or an air display room.

The planning of communications comes next, which will be simplified if there is in existence a comprehensive network of public telephone lines. The communications layout of an efficient raid-reporting and control system is extremely complicated, to say nothing of being very expensive.

When all this has been done it will be necessary to make visits to the planned positions of radar stations to discover points approximating with the plan which will give good ground reflecting quality and ease of defence and camouflage.

(*c*) *OBSERVER CORPS*

An Observer Corps is needed if radar coverage is not complete at all heights down to ground level. As this type of coverage is neither practical nor economical it is usual to include such a corps in the control organization. By its nature an Observer Corps calls for part-time, voluntary workers, however undesirable this form of recruiting may be in such an important organization. Every inducement must be made, therefore, to recruit the right type of individual into the organization.

(*d*) *DEFENSIVE GROUND FORCES*

Anti-Aircraft Artillery

The disposition of anti-aircraft artillery is largely a matter for the army under the supervision of the Defence Ministry in liaison with the air commander. The air commander must be given operational control of the guns, which he will normally delegate to his senior controllers.

Air Force Regiments

These units are intended for the defence of airfields, radar stations and centres of air force communications. The operational control is normally held by the Air Commander, but liaison with the local Army Commander is obviously essential. Their role is one of *close* defence and they can also be made responsible for manning light anti-aircraft artillery.

3. PASSIVE DEFENCE

(*a*) *DISPERSAL OF INDUSTRY AND POPULATION*

In this age of atom bombs a policy of dispersal should be seriously considered. This can be effected by the formation of a defence committee sitting at, say, the Ministry of Defence or the Board of Trade. The committee would consist of representatives of all interested parties. They could agree or not to the siting of new buildings after considering vulnerability, methods of defence, industrial importance, etc. Population could be attracted away from overcrowded and vulnerable areas by inducements of varying kinds.

(*b*) *AIR RAID CIVIL DEFENCE*

A skeleton organization should be set up in the early stages of planning under the Home Secretary. It will contain mainly part-time voluntary workers whose representatives should be kept supplied with intelligence dealing with new weapons, trends of thought, treatment of new types of bombs and any other information relevant to their duties.

(*c*) *CAMOUFLAGE*

The advice of camouflage experts should be sought before the siting of vital civil and military installations are agreed. Existing installations

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should be examined and the best camouflage methods decided upon so as to ensure early treatment in case of emergency.

4. OTHER CONSIDERATIONS

(a) *POLITICAL*

Agreement may be sought between allies to arrange policies of mutual aid. Thus, neighbouring allies may agree to the siting on their territory of radar stations which would give extra early warning. Reporting systems might be combined and co-ordinated by neighbours with obvious benefits to both sides if the language difficulty is not insuperable. The possibility of common headquarters and control centres should not be overlooked, and it would be as well, if this were agreed, to organize interchange of personnel and the standardization of equipment. Joint tactical exercises should certainly be arranged using international raid-reporting systems.

(b) *NAVIGATIONAL AIDS*

An effective defensive air force should be capable of operating efficiently in all weather conditions when flying is possible. To achieve this degree of efficiency training in navigation must be very thorough and well abreast of trends of thought. Ground and airborne navigational devices must be familiar to operators and research and development must go ahead. This may mean considerable monetary expenditure at an early stage, but it is essential for efficiency.

(c) *TRAINING*

High in importance in flying training comes gunnery training. Fundamentally, the fixed gun fighter is nothing more nor less than a flying gun-platform. The whole expensive rigmarole of flying training, scientific research, airfields and equipment, communications, etc., achieves its end when the guns of the fighter are brought accurately to bear upon the enemy at close range. Gunnery training must be given a prominent place in the syllabus of operational training therefore, and when squadrons are formed they must receive training in gunnery at regular and close intervals.

(d) *SCIENTIFIC DEVELOPMENT*

There is little point in attacking a hundred-ton tank with a spear. Likewise, it is essential that scientific development and research keep abreast or preferably ahead of the times. It does not matter much whether organizations studying aeronautical development and research, engineering method, signals, radar and armament matters are embodied within the organization of the air force or not, provided that good liaison is effected and information flows from both sides without hindrance; in any case it will probably be essential to loan air force officers to such organizations to enable them to carry on.

It *is* necessary, however, for the inclusion within the framework of the air force of units engaged in research into new methods of navigation, bombing and gunnery, pure flying and tactics.

(e) *TACTICAL AIR FORCES*

The problem of the continental country wishing to defend itself is fundamentally different from that of the United Kingdom. One is part of a continental land-mass and the other is an island. The first threat to Britain would come by sea or air, whereas the continental country has to envisage attack from air, land or sea. Before the invasion of Europe it was necessary for the Royal Air Force to form an air arm designed to support the efforts of armies. Up until the invasion such an air arm was not essential to our strategy in North-West Europe. On the other hand the continental country visualizes invasion as an attack by land forces supported by air forces. The defence against this form of attack must lie in the armies, supported closely from the air, together with adequate air defence to protect centres of industry and population and communications in the rear areas. Considering the enormous amount of work entailed in forming a pure air defence force and the outlay of money which is begrudged by the tight-fisted treasury, is it possible for such a force to carry out two different but equally essential roles? Perhaps the answer lies in a compromise. A tactical air force must be mobile, but equipment depreciates rapidly when it is trundled around in all sorts of weather—especially delicate radar equipment. Furthermore, it is neither pleasant, nor does it make for efficiency, to house troops under canvas in field-working conditions, away from their wives and families in time of peace.

The compromise can be made by planning for "semi-mobility" in the early stages. This means purchasing equipment which is capable of mobility and using it at first as static equipment. The raid-reporting system, which depends upon a massive network of land-line communications can be nothing but static until methods of mobile communications become available. When this happens, the whole system can be turned over periodically to a basis of mobility to give training in such conditions. Co-operation with the armies can be carried out and flying units will have to practise quick moves to different bases on these occasions.

The aircraft decided upon in the initial planning must be capable of carrying out the role of

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interceptor-fighter and ground-support fighter. It seems a pity to clutter up a high-performance fighter with bomb-racks and R.P. rails, but the only alternative is to allow for two separate types of aircraft, each excelling in its particular role, which complicates matters and makes for greater expense.

5.—CONCLUSIONS

(*a*) *GENERAL*

Countries in war-devastated Europe have much rebuilding to do, which, when added to a natural, reactionary aversion to war, usually leaves the rehabilitation of the Services with the lowest priority possible. The ethics of such an attitude are, to say the least, arguable, but the fact remains. Providing equipment is easily available by local manufacture, which is seldom so, or by purchase from a friendly power, which brings up the problem of payment, the two greatest factors holding up the programme for rebuilding the air defence system are the renovating and building of airfields and the laying of communications landlines. It would seem important, therefore, to allot these two items the highest priority, internally.

(*b*) *NEUTRALITY*

Small countries would obviously prefer neutrality in any future conflict, but it can hardly be sufficiently stressed that the best method of ensuring neutrality is to provide for a powerful and efficient air force. A powerful aggressor might well, given time, be able to annihilate the best that a small country can provide, but the question that matters is will he be given the time? It seems impossible that help would not very soon be forthcoming; the world is now too small for it to be otherwise, and an upset in timing is sufficient to wreck a programme of conquest, as was seen in the last conflict.

(*c*) *PUSH-BUTTON WARFARE*

Many enthusiasts will discount the value of a system designed to counter-attack as we now know it. The next war they say will be fought by small men with big heads from under the ground! Push-button warfare is a possibility which one cannot ignore, but it would be a brave man who would forecast when it will arrive.

Form the antidote to the evil as it is known and it is certain that antidotes to future evils will be forthcoming.

No. 24 (Commonwealth) Squadron R.A.A.F.

Reorganization on an Empire Basis

ROYAL Australian Air Force personnel selected to join No. 24 (Commonwealth) Squadron, based in the United Kingdom, comprise two complete crews. Others will follow in a few months. It is likely that they will be flying Yorks, Dakotas and Lancastrians.

The object of the reorganization of the squadron on an Empire basis is to extend the close co-operation existing between the R.A.F. and the Dominion Air Forces to foster the development of a common technique in air transport matters, and to provide experience of flying conditions and routes in all parts of the world. So that aircrews will be conversant with the routes over which they may be required to fly, training flights to the various Dominions are to be part of the squadron's training programme.

The establishment of the squadron is to be 28 crews, five of which will be provided by the R.A.A.F. and three by the S.A.A.F. on an exchange basis between the R.A.F. and these two Dominions' Air Forces and two by R.N.Z.A.F. The period of service of Dominions' aircrews with the squadron will be from two to two and a half years' duration. The post of squadron commander is to be filled by each of the Dominions and the R.A.F. in turn.

The Squadron will be employed primarily on special flights and the carriage of V.I.Ps., including civilian V.I.Ps. who cannot conveniently be carried by civil aircraft.

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Extracts from the United States Strategic Bombing Survey

FROM "AIR CAMPAIGNS OF THE PACIFIC WAR"

Prepared by the U.S. Military Analysis Division, to whom due acknowledgment is made.

INTRODUCTION

IN the historical treatment and evaluation of any war, the victor may easily be led into platitudes and innocuous analyses. Observing the results of his work—the defeat of his enemies—the victor has the strong human tendency to believe that his methods were right and proper, because he was the victor.

The mistakes of the defeated foes, however, stand out in bold relief. His national structure, strained to the limit and then finally collapsing, clearly reveals the flaws in his thinking and in his military pattern. However, those same basic flaws may have existed within the structure of the victor—but were never spotlighted nor clearly revealed because the structure was never critically strained.

Thus, glibly and with a sense of righteousness and virtue numerous writings today point out the weaknesses in the Japanese national structure and the deficiences of the Japanese war machine. We recognize that his Army and Navy efforts were not well co-ordinated either in the production echelon or the combat echelon; that his concepts of aerial warfare were limited and faulty; that his logistic support plan was incapable of meeting the demands of his strategy; that his concept of defence in depth was limited to two dimensions; that he consistently violated the principles of concentration of effort and economy of force; that he over-estimated the importance and the value of the Pearl Harbour attack and many others. However, we seldom look critically within for evidence of the same weaknesses.

Actually, the United States of America overwhelmed Japan by virtue of the greater depth in our technological echelon, our much greater logistical potential for war, and the geographic disadvantage of the Japanese economic structure. Many of those weaknesses which we condemn in the Japanese war machine were found in our own organization. In fact, many were patterned after our own thinking and establishments.

We overwhelmed Japan by sheer physical strength. Japan inherently lacked the capacity to wage a successful war on the United States of America. However, had we faced an enemy whose logistical potential for war approximated our own and who did not suffer from geographic disadvantages, the weaknesses in our own structure might soon have been tragically apparent. There exists, in the future, a possible coalition of powers whose logistical potential will exceed our own and whose geographic position will be advantageous. It is therefore imperative that, basking in the glow of victory, we honestly examine some of our derelictions.

This document, therefore, passes over rather quickly those things which were done without serious fundamental flaws and attempts to emphasize those features, functions and operations which point up the need for change in thinking, organization or employment of military forces.

SIGNPOSTS

1. Faulty inferences which may be drawn from the war against Japan.

(*a*) If any written evaluation of the war against Japan were to leave with civilian or military readers the impression that another world war may be waged economically and successfully by the United States essentially along World War II lines, it were better that that evaluation had never been written.

This paper has attempted to accent that the factors of geography and weather, time and space, capabilities and limitations of weapons (which are functions of science and technology), and logistical organization and potential are the real factors which govern successful and economical strategy.

To evolve a strategy for the future from the experience of the past in employing carriers, battleships, aeroplanes and armour—and to depart from the basic considerations which should dictate, not only strategy, but also lines of technological endeavour—is to invite disaster.

(*b*) There follows a list of inferences, *possibly dangerous to future national security if accepted without critical appraisal,* which may be drawn from studying only the techniques and results of the military action against Japan.

1. That it will be necessary to fight for and win air superiority in the area of operations.

2. That conventional very long-range bombardment aircraft will be capable of penetrating hostile defences to the maximum limit of their radius of action and destroying the enemy's war economy.

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3. That aircraft carriers will be capable of successfully operating against an effective land-based air force.

4. That naval surface fleets will be able to approach an enemy's shores and bombard his installations during the decisive phase of a war.

5. That it will be possible to build, deploy and utilize great fleets of bombardment and fighter aircraft after open armed hostilities are under way.

6. That the logistical pattern of a future war will so nearly approximate that of the past war that our nation will receive timely forewarning of an enemy's preparation for war.

7. That the nation with the greatest natural resources and logistical potential for war will be the victor.

8. That amphibious forces, supported by air power, may concentrate such overwhelming force in selected areas that landings generally may be made and beachheads secured.

9. That subma ines, which could almost single-handedly have defeated Japan, will have the same capability in a future war.

10. That, since our forces were successful in maintaining and protecting our sea lines of communication in the past war, they will be capable of doing the same thing in a future war.

11. That the bulk of future land armies will be airborne.

12. That, since the United States of America has been able to absorb the first blow in past wars, she will always be able to do so in a future war, and that the great military potential of the United States may again be mobilized and brought to bear after armed hostilities are under way.

(*c*) While some of these inferences may be sound, depending upon the timing of a future war, there is evidence today that many will be very unrealistic in the near future. A brief examination of each, viewed in the light of cause and effect, follows:

1. That it will be necessary to fight for and win air superiority in the area of operations.

Air superiority is not an end in itself. Air superiority was necessary in the past war in order that surface operations could be successfully undertaken and in order that decisive bombing of the enemy's vital components could be accomplished. If science and technology produce an air weapon which can, unaided, penetrate enemy defences and accurately deposit its bombs, it may not be necessary to fight the conventional air battle and obtain conventional air superiority before the decisive attacks on an enemy's economy are mounted. Any force, having successfully made such attacks, however, probably would quickly inherit air domination for the exploitation phase of the war.

2. That conventional very longe-range bombardment aircraft will be capable of penetrating hostile defences to the maximum limit of their radius of action and destroying the enemy's war economy.

Such operations must be evaluated in terms of the decisiveness of the action and the cost to our own war potential. If the over-all damage inflicted on the enemy significantly outweighs the cost of the operation in terms of manpower, matériel, and production potential, the operation may be strategically sound. However, committing a bombing force beyond its capacity to penetrate enemy defences and deliver effective fire could be disastrous in its dissipation of our own war potential. The quality of enemy defences, the decisive nature of the targets selected, the destructive power of the weapons employed, the accuracy with which the warhead may be delivered, and the range and power of the air weapons employed to penetrate enemy defences are factors which will indicate the acceptability or unacceptability of such operations.

3. That aircraft carriers will be capable of successfully operating against an effective land-based air force.

Major carrier operations in World War II against land-based aircraft were conducted after the Japanese Air Forces had been reduced to a relatively impotent and ineffective force. Geography, also, permitted massing an overwhelming carrier-borne air strength on the objectives selected. Geography, likewise, dispersed the enemy's remaining air defences, prevented them from being mutually supporting, and reduced their combat capability by compounding command, control and logistic difficulties. In the history of war, to date, a carrier force has never been pitted against an effective land-based air arm operating from a sizable land mass.

Land- and carrier-based aircraft, once they are airborne, are equally effective within their design restrictions. Carrier-based aircraft, however, have a quality of vulnerability not suffered by land-based aircraft and that weakness lies in the vulnerability to air attack of the carrier itself. It was the vulnerability of the carrier, and not its airborne aircraft, which kept our powerful carrier task forces away from Japan proper until long after land-based aircraft were making the journey to the enemy's home industry on regular schedule.

The carrier's greatest advantage lies in its mobility and its ability to concentrate a relatively large number of aircraft quickly at selected points. This may be particularly appropriate and

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useful against an enemy who does not have an effective air force and whose vital targets are exposed to water approaches, or against isolated defence forces such as those frequently encountered in the Pacific War. However, we must approach with caution any future strategy which calls for the employment of carriers within an area accessible to an effective land-based air arm —particularly if such strategy is founded on the faulty deduction that carriers performed this task successfully in the past war.

Excepting the atomic bomb, the carrier is the most powerful and complete military force concentrated into such a small area. Its landing field, maintenance shops, logistics, manpower, living quarters, communications, anti-aircraft and command post are above one keel. Because of its concentration it presents a very productive and attractive target, singularly vulnerable to modern weapons.

In evaluating carrier aviation of World War II, the primary role of the force must be borne in mind. The carrier was designed to an objective which was sound and which was achieved. The carrier was intended to operate beyond the effective radius of land-based aircraft in furtherance of the over-all mission of the fleet. Functions of carrier aviation included the maintenance of local air superiority in the fleet area, destruction of opposing enemy fleet air capability, destruction of opposing surface fleet units, search and reconnaissance. Carrier aviation was not intended to operate against the enemy's sustaining industry, as the weapon was too costly, the fleet in close proximity to enemy shores was too vulnerable to counter-air attack, and it was not feasible to mass from carrier decks the great air effort required to neutralize an industrial complex. As the war progressed and air domination was achieved, carrier aviation assumed another role with effectiveness in augmenting the fire of the fleet against shore objectives. Carrier aviation, thus, was not a competing instrument to land-based aviation, but was primarily a special task weapon designed to further the over-all mission of the fleet.

4. That naval surface fleets will be able to approach an enemy's shores and bombard his installations during the decisive phase of a war.

All major naval bombardments of enemy shore installations during World War II occurred after the over-all war in the air had been won and after local air superiority had been established.

5. That it will be possible to build, deploy and utilize great fleets of bombardment and fighter aircraft after open armed hostilities are under way.

An early enemy blow in strength at our internal economy, either by subversion or military force, very conceivably could disrupt our training and production capacity to the point that a planned mobilization over a period of time would be impossible. The time required to develop the force, the logistics, and the base areas essential to the operation of a large air force runs into years. As this time may not be available, it may be necessary to fight the war with the forces-in-being at the outset of armed conflict. Bearing on the size of the required force-in-being are the atomic bomb and, possibly, more advanced weapons of mass destruction. Such weapons, scientifically employed, may reduce to a high degree the numerical strength in aircraft of the air force required.

6. That the logistical pattern of a future war will so nearly approximate that of the past war that our nation will receive timely forewarning of an enemy's preparation for war.

It is possible that a war in the foreseeable future may be decided by a force so radically different from the over-all military structure of the past war that the essential logistic preparations will not be self-evident. It is also possible that the over-all logistical effort required will be only a small fraction of that required for World War II.

7. That the nation with the greatest natural resources and logistical potential for war will be the victor.

Logistical potential for war must be converted from "potential" to a force-in-being before it can be applied. Here, again, the time of strategy is virtually important. An inferior over-all economy which is highly organized and directed toward a war objective may be capable of overpowering a much greater peaceful economy before it can be reoriented toward war production. In World War II, the range and destructive power of weapons was so small that major economic efforts had to be focused on the war programme in order to produce significant attrition effects on an enemy national structure. This gave a tremendous advantage to the nation potentially the most powerful. The nature of weapons now available goes far toward eliminating this advantage and places the emphasis on force-in-being rather than potential force.

8. That amphibious forces, supported by airpower, may concentrate such overwhelming force in selected areas that landings generally may be made and beachheads secured.

Geography, technological inferiority of the Japanese, early defeat of the Japanese Air Force, limited destructive power of explosives then available, and America's great logistical potential for war made amphibious operations possible. All these factors may be changed in a future war. An enemy's possession of the atomic bomb in

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reasonable quantities, alone, would cast serious doubt on the feasibility of major amphibious operations against vital or seriously defended objectives.

9. That submarines, which could almost single-handedly have defeated Japan, will have the same capability in a future war.

The geography of Japan's economic structure made her a natural target for the submarine. Possible future enemies, relying on interior land lines of communication, would not offer this vulnerable target to the submarines. On the other hand, if our strategy in a future war elected to conduct major operations from base areas which had to be supplied by long sea lines of communication, as in World War II, our own military effort would become extremely vulnerable to enemy submarines. It is possible that the technological advances in submarine design and construction since World War II ended would make such an attempt on the part of the United States prohibitively costly.

10. That since our forces were successful in maintaining and protecting our sea lines of communication in the past war, they will be capable of doing the same thing in a future war.

Commented on above.

11. That the bulk of future land armies will be airborne.

It should be recognized that all significant airborne operations of World War II were exploitation operations conducted with almost negative air opposition. Further, the troops moved were equipped with such inadequate transportation that they were not satisfactorily mobile on the ground and such light firepower that they could not engage standard ground force units on even terms. If we plan mass air movement of armies with artillery and equipment essential to survival in ground combat, we face a staggering logistic problem. Such plans, if fully implemented, could result in the development and construction of only transport type aircraft from the limited peace-time budget available. For example, the movement of one infantry corps of three divisions (no tanks) on a 1,500-mile penetration, within a period of time considered tactically necessary to insure the security of the debarkation airhead, currently would require the equivalent, in transport types only, of a 70-group air force. This is the total authorized size of the post-war Army Air Forces. If the movement of the airborne army were to be accomplished before general air domination had been won, World War II experience indicates that an additional requirement for fighter aircraft, far beyond our capacity, would be necessary to protect the extremely vulnerable Army aerial train in flight. If the air movement were made after air domination had been won, the requirement of the ground Army for artillery and heavy equipment is open to serious question. It therefore appears that the advisability and practicability of using the air weapon for the mass transportation of lower order combat forces bears close examination, as it very conceivably could impair the development and maintenance of the combat air arm and once again nullify its capabilities by binding it in an ancillary role to a surface component.

This does not preclude the requirement for special purpose airborne forces designed for the exploitation of specific situations. Such special forces may be highly productive. However, mass air movement of armies for orthodox modern surface combat appears logistically impractical, uneconomical and unnecessary.

12. That, since the United States of America has been able to absorb the first blow in past wars, she will always be able to do so in a future war, and that the great military potential of the United States may again be mobilized and brought to bear after armed hostilities are under way.

In World War II we had the protection of space and therefore time in which to mobilize our resources after the first blow had been struck. Because of the limited range and capabilities of the weapons then available, the enemy was incapable of seriously interfering with our mobilization and training programmes. However, these barriers which were our protection in the past have been shrunken by the increase in range and destructive power of weapons and they now constitute a threat, rather than a protection, to our security. They constitute a threat in that they protect and conceal possible enemy axes of approach to within very short distance of our industrial vitals. With the example of two World Wars (in which American industrial capacity was the deciding factor) before a future enemy, he can hardly be expected to plan a strategy which would permit that industry and manpower ever to be mobilized again.

2. Signposts.

From the experience of the past, however, certain fundamentals which are established by a cause and effect relationship may be drawn. An evaluation of the war against Japan, in this light, leads to the conclusion that our national security structure must embrace the following programmes:

(*a*) *Keeping the American public informed with respect to the dangers of accepting the first blow in a future war.* An enlightened American public will appreciate that, to be effective, defence

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of the nation must be extended in space and time. We fully understand, today, that we will be defending ourselves if our forces are attempting to destroy enemy forces which are already raining weapons of destruction down upon our heads. We must appreciate, further, that it is still defensive action, and not aggression, if we intercept and destroy an enemy force *en route* to our nation, bent upon our destruction. Still further, we must recognize that an overt act of war has been committed by an enemy when that enemy builds a military force intended for our eventual destruction, and that the destruction of that force before it can be launched or employed is defensive action and not aggression. If we adhere to the old concept that an overt act by an enemy nation can be only the actual delivery of the first military blow of the war, we invite disaster as a result of the decisiveness of that first blow. As a nation, we must understand that an overt act of war has been committed long before the delivery of that first blow and that the earlier such an overt act is recognized the more effective the defences may be.

(*b*) *Provisions for adequate National Intelligence.* National security cannot be effected in darkness and ignorance. A national intelligence system abridging the compartmentation of State Department, Army, and Navy intelligence activities of the past war is mandatory. To insure our national security—to permit the proper timing of our strategy—this agency must be capable of providing and properly interpreting political, economic, geographical, scientific, technological and military information concerning any possible combination of future enemies.

(*c*) *Extensive Basic and Applied Research and Development Programmes.* The United States no longer has an overwhelming logistical potential for war. The potential of possible coalitions of powers at a future date may even exceed our own. But even if we were to retain a preponderant logistical strength, technological superiority would still be essential to survival, and technological superiority depends primarily on the products of our research and development programmes. The experience of World War II in the war against Japan confirms that the "new weapon" may well be the decisive weapon.

(*d*) *Maintenance of an adequate Military Force in Being.* The maintenance of a military force in being does not mean simply manning a number of ships, aircraft, tanks and associated weapons. It means the construction of a balanced military force, abreast of technology, fully cognizant of the capabilities, limitations and techniques of employment of weapons, organized and administered to exploit fully the current weapons of war, organized and administered to assist in the timely development of new weapons of war, and supported by key segments of sustaining industry in being.

For the future, it is important that our people, our Congress, and our military leaders fully appreciate the part air power played in World War II and grasp something of its future potentialities.

Before World War II the growth and development of airpower was restricted by concepts of surface warfare which visualized the air weapon as an ancillary force. Air power entered the war under this handicap and by slow evolutionary steps, each based on hindsight, emerged as the primary force. Air power was the dominant combat force of the war against Japan and was decisive in that:

Air power dominated its own element.
Air power dominated naval warfare.
Air power dominated ground warfare.
Air power possessed powerful and independent logistical capabilities.
Air power established effective area interdiction by occupation of the air space over an objective area.
Air power was capable of forcing the capitulation of an enemy nation without surface invasion.

The war against Japan clearly demonstrated the military potentiality of air power and its importance and relationship to ground and naval forces. To be successful and efficient, our national military organization of the future must be so constituted and directed that air power may be fully exploited and employed in consonance with the principles of war.

If our nation is to survive in this atomic age, logic demands that our national defence agencies be oriented toward air power, and, further, that the future development of air power not be restricted, as in pre-World War II years, by the inertia of established organizations or personalities.

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The Arab League†

ITS SIGNIFICANCE IN WORLD AFFAIRS TODAY

The support given by the member States of the Arab League to Egypt during the discussion by the Security Council of the Anglo-Egyptian dispute is an indication that for the first time for many years some degree of unity has been reached between those states. It must not be presumed, however, that a new state or federation is in the process of being set up or that a new government to which all the present Arab leaders will owe allegiance is just round the corner. The Arab League is in fact primarily a common meeting ground where Arab rulers can discuss their aims and bargain with each other for support. It would be too much to expect in the near future that the peoples of the various states should regard themselves as allies, despite their common religion.

What is an Arab?

ORIGINALLY, of course, the word "Arab" described a man from Arabia, a man of the desert, proud, but looked down upon by the townsman, or even by the fellahin of Egypt who claim descent from the Pharaohs. For the purposes of the Arab League, however, the term embraces not only the nomadic Bedouins of Saudi Arabia, the Euphrates, Beersheba and Transjordan, but also the Levantines of the Mediterranean seaboard and, rather surprisingly, the Egyptians who, not so many years ago, would have indignantly denied the relationship.

It seems clear that the Sudanese are not included, in spite of their large Mohammedan element and of Egypt's big brotherly attitude towards their country. At the same time, Syria and the Lebanon, with large Christian populations, are active members.

The original signatories of the Arab League Covenant were the delegates of the Kings of Iraq, Saudi Arabia, Egypt and the Yemen, the Presidents of Syria and the Lebanon, and the Amir (now King) of Transjordan. Provision, however, was also made for other independent states to be included as and when opportunity afforded.

An annexe to the Covenant makes special reference to the independence of Palestine. The text reads: "Although the external aspects of that independence are not apparent owing to force of circumstances, this should not stand in the way of her participation in the work of the Council." Palestine Arabs are, therefore, represented on the Council, together with the seven members of the League. In fact, opposition to Zionism is probably the only question on which the members are unanimous.

The League is now seeking to spread its protecting wing over the North African coast to cover the people of Cyrenaica, Tunisia and Morocco. The recent protection of Abd el Krim by the Egyptians illustrates this tendency, which has caused the European powers interested in those areas some concern.

Origins of the League

Pan-Arab enthusiasts are inclined to claim that the movement has its origin in the dim past, dating back to the days of the Caliphs of Baghdad (A.D. 661 to 750), conveniently ignoring the dynastic and sectional interests which have always divided the Arab world in spite of their common language and culture and their common law based on the Moslem religion. The 1914-18 war which liberated the Arab races from the Turks also served to deprive them of some of the ties which formerly united them, a common currency and a unified system of government. Improved communications, however, and the national ideals encouraged by the peace settlement, gave a new reality to this conception of unity.

During the inter-war years Arab solidarity was demonstrated chiefly by the interest taken in the Palestine question; the efforts of the rulers of the Arab countries at the time of the Arab rebellion in Palestine and the London Conference in 1939 led to the issue of the British White Paper which determined the rate of Jewish immigration.

Considerable stimulus was given to the Arab movement by Mr. Eden's speech on 29th May, 1941, when the British Foreign Secretary said that it seemed both natural and right that cultural and economic ties between the Arab countries, and political ties too, should be strengthened—but added that clearly the initiative would have to come from the Arabs themselves. Great interest was shown in Egypt at the time but the personal rivalry between King Farouk and Nahas Pasha caused the former to keep aloof.

The Greater Syria Movement

In January, 1943, Nuri Pasha Said, the Iraqi Prime Minister, submitted a letter to the Minister of State, Mr. Casey, proposing the formation of a "Greater Syria" which, once formed, might

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become the nucleus of an Arab League. Little enthusiasm resulted, however, partly because such proposals aroused suspicions that the House of Hashim had aspirations which neither Egypt nor Saudi Arabia could accept. In fact, discussion on the subject between any two statesmen or powers seems to have caused such annoyance and jealousy elsewhere that it is surprising that any agreement was arrived at; Nuri Pasha himself certainly lost much of his enthusiasm for the League when it came into being. Neither King Farouk nor Ibn Saud could picture himself in any role but leader while the Amir Abdullah of Transjordan said he would never tolerate Egyptian domination in Syria.

Attitude of other Powers

Meanwhile France, although willing, officially, to grant independence to the Levant States (while still retaining a degree of control similar to that held by Britain in Iraq) could only see in the idea of Arab unity a threat to her own interests in the Levant is well as in North Africa. Her opinion is not likely to have changed since then.

The Turks looked on the prospect of Arab federation with scepticism. They preferred to have a number of weak but independent states as neighbours rather than a single important power. Today no doubt their chief concern is that as strong a resistance as possible should be offered to possible Russian aggression through Persia.

The Persians likewise, preferred a weak Iraq as a neighbour rather than a strong Arab federation which might conceive territorial ambitions towards the Persian-Arab province of Khuzistan. Now they have more to worry about.

The Jews, characteristically perhaps, hoped that if all the Arab States were united immigration would be easier, since the immigrants would constitute a smaller proportion of the population of a federal state. They have since been disillusioned.

Since its formation, the Russians have systematically ignored the Arab League, though expressing tacit support for Arab nationalism and, on principle, taking an anti-British line in the Anglo-Egyptian dispute in New York.

The Covenant

The object of the League, in the words of the Covenant signed in Cairo in March, 1945, following the Arab Conference in Alexandria convened by King Farouk, is as follows: To strengthen relations between member States, to co-ordinate their political action with a view to collaboration between them and protection of their independence and sovereignty, and generally to consider all questions concerning the Arab countries and their interests. Co-operation is aimed at in cultural, social, health, legal, financial, agricultural, industrial, and communications matters.

It is not permissible to resort to force in order to settle disputes between two or more States of the League. Disputes likely to lead to war between the States of the League must be brought before the Council of the League for mediation. However, decisions taken by a majority of the Council (as distinguished from unanimous decisions) are only binding on those States that accept them.

So loose in fact are the ties binding the members of the League, that it is found necessary to point out in the Covenant that member States are permitted to conclude closer and stronger ties if they so desired, but that such treaties do not commit the other members.

The League's policy is to rely on the United Nations for the protection of individual members and the Covenant contains no military clauses. It might be said, in fact, that so far as the outside world is concerned the League is mainly symbolic—of Arab independence and unity.

Permanent Seat in Cairo

Despite alternative claims from certain members, the permanent seat of the League is in Cairo. Ibn Saud's claim for Mecca was turned down owing to certain representatives of member states not being Moslems. The Council, on which each State has a single vote and takes its turn for the presidency, meets in ordinary session twice a year, in March and October, but in case of emergency any two member States may demand an extraordinary session.

The Secretary General, who holds the rank of Ambassador, is appointed for two years at a time and has the power, with the approval of the Council, to appoint the Assistant Secretaries and senior officials.

One year's notice is required before a State can withdraw from the League, but the Council may consider any State that does not comply with its obligations to the Covenant as excluded from the League. For this a unanimous vote is required, excluding of course, the vote of the State in question.

Despite their apparent unity, the goal of real solidarity among the Arab States has not been reached. This is partly due to their leaders having little experience in political dealings, but mainly to the intense mutual distrust among the heads of States. King Farouk of Egypt wishes to be the recognized leader of Arab affairs and even aspires to the Caliphate. In this, however, he would be hindered by the intense political feeling within his own country which is only suppressed

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by constantly fanning the flames of anti-British and anti-foreign feeling. A counter to Farouk's ambitions would be found in King Ibn Saud who has far more logical claims to the Caliphate. He, in turn, is hated by the Hashimite Kings of Iraq and Transjordan. The latter's aim for a Great Syria would, of course, tend to split the League as now constituted.

Abdurrahman Azzam

The leading force in the League is undoubtedly Abdurrahman Azzam, its Egyptian Secretary-General, a man of great energy, ability and enthusiasm and possessed of personal integrity. It is difficult to say whether he is more Arab Nationalist or Egyptian. There is no doubt that he has been using his position in the League to further the interests of his country. His broadcasts on the Anglo-Egyptian dispute, though made as Secretary-General of the Arab League, were, in fact, the voice of Egypt and some resentment must have been felt by the other Arab rulers on hearing Azzam expressing sentiments with which they, as traditional friends of Britain, were not at all in sympathy.

It is interesting to note that the anti-British tirade by the Syrian President of the Security Council on the occasion of the Egyptian application to U.N. was contrary to the sentiments of his Government at home and has been repudiated by them.

Anti-Communism

One aspect is quite clear. The rulers of all the Middle East States are most definitely anti-Communist. Furthermore, although some of the only too numerous "have nots" among their subjects must feel they would be individually better off under a communist regime, the tenets of the Moslem religion oppose that ideology. However hostile the Arabs might feel towards the Western Powers over such matters as the Sudan or Palestine, they know on which side their bread is buttered. Nevertheless, Communist propaganda might find fertile soil in the inevitable disappointments to be expected when a compromise is arrived at on the Palestine question. A brief study of Middle East geography and of very recent history might encourage an appeal to the U.S.S.R. for political or even military assistance.

The Western Powers regard the Middle East States not only as a barrier to Soviet expansion (though of course, of practically no military value) but as a vital channel of communications with the Far East and, even more important, as the possessors of a large proportion of the world's oil reserves. On the map the area appears extremely vulnerable. It would be infinitely more so if the friendship of its peoples was lost to the Western Powers.

PAPERCHASE (*Continued from page* 113)

Purely destructive criticism is useless. Unfortunately the problem is so complex that no single suggestion, even if it proved practicable, could be applied universally. The germ of an idea can be shown by a typical example. Station "A" desires something for which Air Ministry authority is likely to be necessary. If the request in made in letter form, there will, under normal procedure, be re-drafting of the request by Group and by Command if these "levels" endorse the request. But essentially the letter reaching Air Ministry is the substance of that originated at Station "A." Now if the original request had been made in quadruplicate, each "level" could retain a copy, adding any comments, and the final document could pass to Air Ministry without transcription.

Manifestly, an analysis of correspondence falling in many categories would be necessary to discover what improvements could be made; it is always conceivable that an apparent lack of economy may be inevitable in the interests of overall efficiency.

* * * * *

And I wonder if the expenditure of these words, time and paper was really justified?

REMINISCENCES (*Continued from page* 114)

intervened with a sharp "Go ahead and buy them."

The remark threw poor Mr. Brigstock out of his stride and he began to mumble something about putting up an official letter.

"No, no," said X, "the *Aide Memoire* says that unless you buy these equipments right away the manufacturers will have to get them go to the Rumanian Government, so clearly you must take immediate action." He added, with a surreptitious wink at Alan, "You see, I have read your paper."

It was all settled in a few minutes and the Air Ministry party was bowed out. Mr. Brigstock stood on the steps of Treasury Chambers mopping his forehead. "I can't make it out," he repeated several times. "I have never in all my experience known the Treasury treat a proposal like that. Most extraordinary! *Most extraordinary!!*"

A week later the Department of Civil Aviation began taking delivery of the first equipment, and a chance inquiry to Mr. X's office elucidated the information that the Assistant Secretary had on the day subsequent to the interview retired to a nursing home with a nervous breakdown!

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Paperchase

By Wing Commander H. R. P. Patterson, O.B.E.

I THINK it was Sir A. P. Herbert who came to the conclusion that the average commercial letter could be reduced to half its length without sacrifice of either sense or style; and, that if this were done, firms would need only half the stenog aphers, half the typewriters and half the paper they use at present.

When one examines the principles and specimens of Service writing there is a feeling that we are far from being economic or even up to date in our procedures and usages. Nor does it end with the Services. Nearly all Government departments are hampered by manners and convenwhich, in these times of economic stringency, should go by the board.

The first consideration, of course, must be economy of words, a matter pursued not only by Sir Alan but by many others including Sir Arthur Quiller-Couch and Lord Tweedsmuir. Not least, Mr. Winston Churchill issued a very pointed instruction on the matter early in the war which has been reproduced in the Air Ministry Staff Handbook (second edition, 1943). This is the final paragraph:

> *"Reports drawn up on the lines I propose may seem rough as compared with the flat surface of officialese jargon. But the saving in time will be great, while the discipline of setting out the real points concisely will prove an aid to clearer thinking."*

Verbiage, ribbon writing and Service jargon spread like weeds. Let Prune No. 1 launch "consider the advisability of investigating the feasibility . . ." and, bless you, Prune No. 2 will not only copy but, like as not, counter with "in the light of accumulated knowledge and experience and in view of the prevailing conditions. . . ." One has every sympathy with the Admiral who wrote, "My Lords, I regret that I have not time to write a short letter . . ."—the art of writing concisely is not easily acquired. But there should be some means of eliminating those found guilty of perpetuating phrases that merely serve to confound the reader and reflatulate the author. Certain conventions are forced upon us. "I have the honour to . . ." is not more irksome as a matter of drill than "A bright and happy New Year," or even the verbal salutation, "Cheers." Within these conventions, to quote again from Mr. Churchill, "let us not shrink from using the short, expressive phrase, even if it is conversational."

Now let us look at the machinery of message and letter-writing in the R.A.F. For the signal and the postagram there are prescribed forms. For the letter there is F348. Important formations have "headed" notepaper. All requirements seem to be met. Yet it is a fact that in certain units letter after letter is being typed on plain paper and in every case the address and other titling have to be "hand done." Even the smallest firm can afford to have a printed address and telephone number; it would be right to say it cannot afford to do otherwise. Surely the smallest unit in the R.A.F. could be provided with a rubber stamp?

Now in the Royal Air Force we have several letter styles. Leaving out of account the Air Council letter and the Air Ministry departmental letter (as being rather holy ground) there remain the formal official letter, the informal official letter, the demi-official letter and the postagram. The latter has a special form No. 1924, but the other letters all have their little architectural peculiarities and conventions which have to be observed by the writer. It seems to be within human ingenuity to devise a "letter-form" which would provide a standard outline for all these cases but still permit a choice of "free-style" or formality as the occasion demands. Forms may be one of the many miseries of modern civilization but at least they do serve the purpose of standardizing essential information.

A typewritten letter is usually the joint effort of two people—the author and typist. The greatest efficiency is achieved when the author can compose and dictate and the typist can write shorthand and type. Today we are short of stenographers, and dictation is becoming a lost art. The laborious method of writing the draft of letters long hand for transcription by the typist is a terribly wasteful process. Many of our typists know a little shorthand; many letter writers can try their hand at slow dictation. By mutual help great deeds are accomplished. . . .

To round off these remarks let us finally glance at procedure—at the methods in use for passing information down, say, f om Air Ministry to small formations (*i.e.*, to low levels), "through the normal channels," or for that matter, from the low levels to the rarified altitudes above. How often is a letter merely transcribed at Command or Group, often in identical terms, only the date, reference and address being changed? What a waste of time, effort and material this involves.

(*Continued on page* 112—*opposite*)

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Reminiscences

(Continued)

By Wing Commander D. L. Allen, A.F.C.

5. THE GENESIS OF THE CIVIL RADIO NET-WORK IN THE UNITED KINGDOM

In the early nineteen-thirties, various small air transport enterprises were struggling to establish internal services in the United Kingdom. Their difficulties were aggravated by the lack of radio and meteorological facilities, for the only organized airway at the time was from Croydon to the Continent and this was not free of shortcomings.

On a September afternoon the Directorate of Civil Aviation held its preliminary meeting to discuss the Annual Estimates to be presented to Parliament in the succeeding February. Alan's plea for £25,000 towards the provision of some twenty radio stations met with a frosty reception. It was pointed out that the Treasury had ruled that radio and other installations could not be laid down until the inauguration of services had shown the outline of the air routes needed. To which Alan rejoined, that as air services could not operate with safety and regularity without adequate ground facilities, they were getting into a vicious circle. Civil Service inertia, alas, won the day and disconsolately Alan departed to catch the night train to Aberdeen. There were some points to be settled regarding an aerodrome project at Dyce, and the local authority of Inverness wished to consult a Ministry representative on matters aeronautical.

After dinner at the Station Hotel, Inverness, Alan was joined by Mr. Fresson, who at the time was operating, despite every conceivable difficulty, a surprisingly regular service between Inverness and Orkney. He was even talking of extending to Shetland. It was a splendid example of the triumph of guts and determination over obstacles and obstruction.

Alan and Fresson had known each other in the days when R.F.C. Canada had wintered on American aerodromes at Fort Worth, Texas. Although now a "swivel-chair pilot," Alan never allowed himself to forget his obligation to the pilots who were doing the real job. Quietly and modestly Fresson and one of his pilots told of their experiences. Alan determined that the brick wall of official inertia had to be overcome and Fresson would have to be provided with radio and meteorological aids.

On the succeeding Sunday, Alan happened to be golfing with the Director of Civil Aviation, and over lunch told Colonel Shelmerdine of Fresson's battle against adversity. He aroused in the Director that sympathetic response which, in the old days at least, the plea of a pilot invariably awoke in a fellow aviator. Shelmerdine promise there and then, that despite the decisions of th Estimates Meeting he would assist Alan to pus through his project for a radio and met. ne work for civil air transport in the United Kin dom. Alan prepared a paper, subsequent known as the *Aide Memoire*, to which Colon Shelmerdine gave his blessing and induced th appropriate Assistant Secretary, as representin finance, to accept. After some polishing by M Brigstock, the *Aide Memoire* was sent to one the Assistant Secretaries of the Treasury with humble request that it might form the basis of discussion.

It used to be said that in matters of finance th three toughest institutions in the world were th Vatican, the Miners' Federation and the Trea sury, so that it was not without surprise that phone massage was received that Mr. X of th Treasury would be glad to discuss the projec On the appointed day, Colonel Shelmerdin lunched Mr. Brigstock, priming him well wit the subject for discussion and with port.

Alan was the first to arrive at Treasur Chambers and when ushered into the sanctun of the Great Man was greeted with: "Hullo, goo afternoon. You are a bl—dy sort of a fellow!"

Taken aback for the moment by such a greet ing from a pillar of the Civil Service, Alan re joined somewhat tartly, "And pray why so?"

"What the hell to you mean by putting up scheme which I can't turn down?" came th rejoinder.

The ice was broken, and Alan knew the battl was won. For the next five minutes the reparte was as swift and indecorous as it was apt. Jus as Alan was asking X if he knew the one whic began, "They were only road-menders' daugh ters," Colonel Shelmerdine and Mr. Brigstoc entered. Deferentially they greeted X, for a Under-Secretary of the Treasury is no small bee in the Civil Service world, and is approache with awe, if not reverence, by mere Directors an Under-Secretaries of Departments.

Mr. Brigstock put forward the case for th provision of the radio and met. network. H chose his words with care and made his point well, but it was with considerable diffidence tha he referred to the need for the immediate pur chase of equipment for ten stations. Such requests all too often fall on the deaf ear of the Treasury.

To Mr. Brigstock's evident astonishment, X

(Continued on page 112)

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The Speed of Communications

By Squadron Leader H. F. Jacob

Contributed to the series, "Lessons I have learned from the War"

THE Signals Service of the Royal Air Force was formed primarily to provide communications between commanders and their subordinates, and to control the operations of an Arm which had characteristics distinct from the other two Services—such as the ability to strike anywhere within a wide area at any moment. Now, as far as the Signals Service is concerned, the focus should be on that last phrase, "at any moment." If our aircraft are to strike with the minimum delay—surprise is an important and oft-winning factor in war—the commanders must be able to make their decisions known in the shortest time.

My experience in an overseas theatre of war—and it is in such a theatre, devoid of the speed of communication and comfort of mind associated with G.P.O. installed teleprinter circuits—is that one becomes aware of the deficiences of wireless telegraphy communications. The commander is not able to operate his forces in the shortest time, unless the shortest time is assumed to be many hours. By "operating his forces" I mean the near-tactical and strategical control of air forces and not the minute-to-minute tactical control which is accomplished at speed using radio telephony on very high frequencies.

Without statistics, and they are the only reliable guide, but relying on memory and experience alone, I would say that over any period of one year and certainly during the latter part of the war the average time taken between the origination of a message and its receipt by the action addressee would be about six hours. I have taken into account all categories of messages with various priorities.

From this fact then comes, perhaps, the greatest lesson that I have learned from the Second World War. It is this. That, whilst a message is passed over the greatest part of its journey at 186,000 miles a second, the average time for a message to reach its destination is about six hours.

The following factors, which can each be expressed in terms of time, account for those six hours. The originator's thought on his subject; the message being typed by a clerk or written by the originator; the journey of the message to the cypher office; the logging, cyphering at about twenty groups per minute and possible delay whilst the message is waiting in a heap of other messages in the cypher office; recording and logging in the traffic office; its despatch at about fifteen words per minutes by hand-operator after, perhaps, a delay through being one of many messages awaiting transmission or because the W.T. channel was already occupied with other traffic. The message, after arriving at the receiving operator's end, is again recorded and handled in the traffic office, is decyphered and logged in the cypher office, and finally arrives at the addressee after being handled by the registry staff or the clerk in the operations room. But one fact has been missed. Didn't the message sometimes have to wait its turn, according to the degree of priority and the time of origin, with, perhaps, another twenty or thirty messages? These heaps shrank and grew. Didn't it always seem that, the more intense and sustained the operations, the more messages waited in the heaps? Wasn't it also at these times that everyone had something important to say—at least, they considered they had—and more and more people originated "immediate" messages, and there would be odd cases of junior officers throwing in an "emergency" or "most immediate"? Signals staffs were very conscious of these heaps. How much time was spent by signals officers investigating delays to messages? In an effort to alleviate the position, additional cypher machines and staff were added to units; additional W.T. channels and operators reinforced the overloaded circuits. But there is a limit to all this; equipment, operators and frequencies are not inexhaustible. Still the traffic remained at the same daily level and there was only a small reduction in handling times. The traffic level remained high because originators still thought their instructions were of sufficient importance to be despatched by signal; this, despite early entreaties by Chief Signals Officers to reduce the number of signals originated, and echoed later in more severe terms by higher staff officers up to commanders-in-chief. Detailed checks were made by signals officers of matter which, having been transmitted by signal, was questionable as essential material to be despatched by this speedy means. But there was always the same kind of excuse: "This was in reply to an immediate signal"; or, "I had to know the answer by this evening"—and, of course, there were many more reasons all equally plausible. For, after all, what right had a signals

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officer, whose job was to provide communications for the use of staff officers, to question the necessity for a message to be transmitted by wireless? He was there to pass it to its destination, and pass it quickly, too.

So here, perhaps, is a suitable point to suggest a means of ensuring that only essential matter—essential only to the operations of the day or the immediate future—is despatched by signal using electronic methods. I know there are, perhaps, serious objections to any rule of this kind, and no doubt it would have many disadvantages which are not immediately obvious to me. Nevertheless, a detailed examination of this problem would, I think, increase the efficiency of our communications and give the originator what he wants—a message delivered to the addressee in the shortest period of time.

Air Ministry Confidential Communication Orders, now renamed, and Air Ministry Orders told signals staffs and originators what types of subject matter were not to be transmitted as signals. This list was quite short; there were many loopholes. A list covering every eventuality would result in a document too large in bulk to issue generally. No, I would suggest that a restriction be applied to the officials who could originate signals; not a restriction on what can be sent in signal form. I would say that in a headquarters staff, only officers holding certain appointments and in certain branches should be allowed to originate subject matter in signal form; by signal form I mean, any message to be transmitted by electronic methods. I suggest the Air Officer Commanding; his three principal staff officers, the S.A.S.O., S.T.S.O., and A.O.A.; the Plans, Operations, Intelligence, Signals and Organization Staffs and the Meteorological Service would form this list. No others. For the remainder I would permit subject matter to be written on message forms. Originators like these forms; their use covers errors in composition, no literary talent is needed, and they lend themselves readily to being written by the originator without recourse to typists. These messages would be handled by a method other than electronic which I shall discuss later in the paper. I believe that by imposing such a restriction now, we would educate originators in the correct use of the Signals Service and ensure that in a future war our communications, certainly by radio, would handle only those messages which are really essential to the day-to-day operations. Then I think the Signals Service can give the originators what they want; perhaps not delivery at the speed of light, but an assurance that each message will be in the hands of the addressees within an hour or so of origination. Having applied this restriction to the controlling formations, the principle should be applied to the working units on the same basis. No delegation of responsibility to be allowed at any level.

Having segregated those messages which need despatch at the greatest speed from those which are not quite so urgent, there next comes the question of ensuring that the latter get into the hands of addressees within twenty-four hours of origination. The method I am proposing here is not original—it was operated with great success in the Mediterranean Theatre in 1943 and 1944—but the allocation of responsibility for the service is new. Briefly, the method is this. Each command in an overseas theatre should operate its own Air Despatch Letter Service. Services would be organized along main routes between command and group headquarters, and with feeder routes between wings and miscellaneous units and appropriate group headquarters. Fighter aircraft should be used and flown by tour-expired crews keeping in flying practice. I recommend fighter aircraft, not because I expect only a light load to be carried, but to economize in the number of aircraft and crews employed on the service; multi-engined transport require fighter escort over many routes in an overseas theatre. Next, an air schedule should be prepared on the principle that the time interval between any two units within a command, preferably those most distant relatively, should not exceed twenty-four hours. Aim at something less than this initially. Despatch riders should operate to tie-in with the arrivals and departures of the air couriers and I would suggest that the terminals of the former should be in signals offices at units and air traffic offices at airfields. Originators not authorized to originate messages for transmission by electronic means would place the word "Airgram" in the space for the originator's instructions on the message form. The form, having been completed, would be taken immediately to the signals office. After logging it would be parcelled with other messages addressed to the same units and carried by despatch rider, at scheduled times, to the staff of air traffic control. The latter would be responsible for handing the parcels to the aircraft captain. On arrival at the airfield of destination, the messages would be delivered to the air traffic office. The despatch rider schedule services would then convey them to the unit signals office and this staff would deliver the messages direct to the addressees.

In advocating the handling of airgrams by signal staffs I am not being critical of the administrative staffs in registries. The point is, signals staffs, by virtue of their training and environment, are imbued with the idea of dealing with messages

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in the shortest possible time; they are not involved in the multitudinous tasks connected with the handling of correspondence where speed is a secondary consideration.

Returning again to the necessity for commanders to make their decisions known in the shortest space of time, brings to mind the next aspect of communications which would make this possible. I refer, of course, to the use of radio telephony between senior commanders and their subordinates, and between operational staffs dealing with tactical problems where minutes mean many miles; the fighter controller and the air traffic controller are examples.

The introduction of the Army Set, Type 10, was a very important contribution to short-range speech using radio between ground stations. Its range is limited, and to increase this to medium distances would need the employment of intermediate relay stations. I feel that these latter, frequently in very isolated and often well-nigh inaccessible sites, would be uneconomical even in war and would certainly present serious administrative difficulties and problems of defence. I, therefore, suggest a similar equipment, using channel pulses, but operating within a high frequency range to enable medium distance communication between fifty and one thousand miles. Technical considerations, such as congestion in the frequency spectrum and the construction of suitable aerial systems, are many but perhaps not unsurmountable; I feel that if there is a real need for this invaluable service, research and development should be able to provide the answer. Surely the ability of commanders in the United Kingdom to speak to each other by telephone contributed largely to the speed and efficiency with which operations were mounted? So why not provide commanders in the field with this facility? They frequently have no landlines early in campaigns, and often those circuits which are available are undependable. Radio telephony is a means whereby personal contact can be made over many hundreds of miles; a sense of urgency or anxiety can be expressed which is impossible when the impersonal message, transmitted by wireless telegraphy, is used. Most impressive results were obtained over a long-distance radio telephone channel which operated between the Air Traffic Centres at Malta and Cairo. The distance was about one thousand five hundred miles. The user with his telephone hand-set and loudspeaker was able to converse with his opposite number hundreds of miles away; it was instantaneous and personal contact.

Whilst it is so easy to be critical and often so difficult to be constructive, I feel that in these post-war years there is a great opportunity for research into the methods of point-to-point radio communications used in the Royal Air Force. Not just research and development into the methods used, but rather a study in time and motion to find the best system of handling a message; what is to be the minimum number of handling points *en route* and what minimum action is needed at each. The "Four-Year Plan" for radio teleprinter circuits throughout the Commonwealth will undoubtedly improve the speed at which a message can be received and increase the traffic load between terminals. Can we improve this speed by eliminating logging and recording at each office? Can we dispense with hand cyphering?

Research in the sphere of radar, most likely at the expense of communications research, was so handled that we in England led the world and reaped great benefits. I am certain that a similar measure of success can be met by research into communications.

Mariners of the R.A.F.

A NEW branch, the Marine Branch, has now been set up in the Air Force. Its main duties are the command of R.A.F. vessels and Marine Units, some related staff and marine engineering posts.

The vessels include a flying-boat depot ship, two auxiliaries which serve as radar and torpedo targets, high-speed target-towing craft, and numerous smaller types for bombing ranges and flying-boat stations.

Under long-term plans most permanent officers will be drawn from regular N.C.O. coxswains. If necessary, additional officers may be drawn from other sources such as from other Air Force officers with the necessary qualifications or from Merchant Navy officers. For the present, permanent officers will be chosen from marine officers holding emergency or extended service commissions.

There will be a few marine engineer posts, most of which will be filled by officers of the Technical Branch of the Air Force. Those posts which require Ministry of Transport marine engineer certificates will be filled by recruitment of fully qualified Merchant Navy engineer officers or ex-naval engineer officers on a short-service commission basis for five years' active list service, with a gratuity at the rate of £100 a year.

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The Proficiency of Aircraftmen

By Flight Lieutenant H. Clark

Contributed to the series, "Lessons I have learned from the War"

THE lessons I learnt from the war are directly connected with peace. I learnt—or, perhaps, the knowledge in me crystallized after lying dormant for years—that the Air Force rejected a great wealth of talent when, having conceded the granting of cadetships to apprentices, it then confined the cadetships to those who were medically fit to fly. I learnt how a man can spend twelve years in the Air Force, and yet, on the outbreak of war, and during the years of the war, find himself pitifully equipped to deal with the new tasks that war brings, and which are invariably so different from those of peace, even in a fighting Service. Perhaps it is more important to set down the second lesson first, because the Air Council seems to have gone half-way to learning the first one. It is only fair to stress the fact that nearly all the general views expressed are a result of conclusions reached whilst I was overseas.

To illustrate my lessons, I must tell the story of a man's career, a man who joined the Air Force at the age of sixteen, as an aircraft apprentice. He did well as such; he was fairly intelligent, and moderately hard-working; he played hard, and had a great enthusiasm for the life. He finished up as a Flight Apprentice, passed out well, and was recommended for a cadetship. He got no farther than the Central Medical Board; they found enough things wrong with him to make his ability at games seem rather surprising. So, instead of returning to "the other house" at Cranwell, he went out into the Service proper as a L.A.C. W.O.M.

He spent his first year of man's service employed as a ground wireless operator at a station headquarters. From there, he found his way to a squadron, and, after some discouragements on the medical side, became a part-time air gunner. This was a great step forward; he led a much more varied and exciting life than hitherto, and, as if this were not enough, wore an extra badge and earned more money. After two years of this life, he went abroad. Arrived at his new station, and realizing that his flying job was not helping him much in his trade, he applied for employment on the ground. He spent three months in a transmitting station whose equipment consisted of three ancient transmitters, then boredom drove him out, and he returned to flying. This time the die was cast. He continued as an air gunner for the next five years—a change of station, a change of squadron, a change of aircraft, but no change of occupation. Naturally, he became a good air-wireless-operator, and his assessments as such were exceptional. By Munich-time he was a Corporal, and, by the time war broke out, the ripple of promotion which had started with the expansion had caught him up and borne him into the Sergeants' Mess.

So, standing on the threshold of war, there is a Sergeant W.O.M. Let us analyse his career, with particular reference to training, up to this time. He had received three years' *ab initio* instruction as an apprentice; he had then spent a year as ground wireless operator at a slack (from the traffic point of view) station. After that, with one break of three months, which had not done him much good, he was employed for seven and a half years as a wireless operator air gunner-cum-flight wireless mechanic, during which time he spent far more of his working hours in flying from place to place, filling up with petrol, picketing down, practice bombing, cleaning guns, and so on, than at his basic trade. The wireless mechanic part of the job had consisted of servicing, always for his own use, two closely allied types of wireless set, their associated power supplies, and the very simple electrical system of the pre-war aircraft. What does the analysis show? From leaving the apprentice school he had received no instruction whatsoever in his trade, other than to be shown, by the people he was about to relieve, how to operate two different types of wireless set. He had gained experience at one job, and on a very limited range of equipment.

Let us see now what the Service could reasonably expect of a Sergeant W.O.M. who had successfully passed his Allied Trades test. He should have been capable of running any but the largest of transmitting or receiving stations, having a thorough knowledge, within a short time of taking the job over, of all sets, aerial and feeder systems, power supplies, remote controls, operating and traffic handling methods. He should have been capable of taking over a large workshop in a maintenance unit and been able to approach with confidence all the varied types of equipment brought to him for modification or repair. He should have been able to hold down the

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job of Signals N.C.O. on any type of squadron. Or, lastly, he should have been worthy of consideration for instructional duties.

Which of these jobs could our man have tackled? As nothing is known of his instructor abilities, the answer is fairly obvious—that of Squadron Signals N.C.O.; and even at that, he would have had a lot to learn, from both the technical and administrative points of view. So it would not be unfair to say that the product of twelve years in the R.A.F. was a man of very narrow knowledge and experience.

Some attempt should be made here to understand the man's inadequacy for most of those tasks which the Air Force required him to fulfil. The point which stands out above all others, to my mind, is lack of training. He was engaged in what may be termed a young and growing business—the radio trade. It was changing and developing so fast that almost every issue of the Wireless World seemed to present a new technique, or open up a new avenue for exploration. What was done to keep him abreast of this progressive surge? The answer is nothing, simply nothing. He was left to play, for years on end, with the antiquated pieces of equipment which passed for aircraft communications sets, and if there had been no war, he would probably have been left for much longer. What commercial firm, whose livelihood depended on an industry which was yearly re-shaping itself, would allow its technicians to moulder for nine years, without doing something to bring them up to date? Yet the Air Force did so, and, though not a commercial institution, it was preparing for something far more important than the holding or capturing of markets. It was—or should have been—preparing for war.

Which brings me to my second point. Incredible as it may seem, at no time during that man's service, except around the Munich period, was there any mention of preparation for war. Admittedly, he had been taught how to use a Lewis gun, and to drop practice bombs, but even there the emphasis was always on individual, inter-flight, inter-squadron competition, and never on war—and, in any case, this was a result of his being an air-gunner, and was not connected with his being a technician. In fact, throughout his Service life, he had been wrapped in a cocoon whose fabric was made up of station life, games, overseas tours, trips to this place and that, and the occasional interest created by the arrival of visiting flights or squadrons. There was none of the insistence on preparedness for war which there should have been, all the time, and as there was, later, when a war was actually on. The fact should have been kept in front of him, like a carrot in front of a donkey's nose, that he was one of the nation's warlike representatives—not to make him relish the idea of war, but to encourage him to keep himself on top of his job against the event. He should have been told, and told again, that when war broke out, it would be for him, and about forty thousand others, to train many hundreds of men and women to the occupations of war. And to fit him for that training, he himself should have been trained right up to the minute. Of course, this is all old stuff—we all know now that we should have been prepared. But this was not only a matter of preparedness, it was a matter of keeping an institution—the Air Force—and its inmates (I use the word advisedly) in touch with their purpose in life. A whisky-selling firm never loses sight of the fact that its prime task is the selling of whisky, and, to promote sales, it ensures that its representatives are versed in the latest selling techniques. (I speak, of course, of the days when firms had to sell their products, instead of doing their customers the favour of letting them have a quota.) The between-the-wars Air Force, however, allowed its airmen to remain utterly ignorant of the fact that preparedness for war was their prime duty to their Service.

The third point, which is bound up with the first, is that of a man's ability to pass on his knowledge to others. Admittedly, every man cannot be an effective instructor, but he can be given some tuition in the technique, and he can be "vetted" for his inherent ability to instruct. He may not be a good lecturer, but he may have the making of a practical instructor, or, on the other hand, he may not be able to put things over at all. These facts about a man should be known, however, so that when a war, actual or impending, calls for intensive training, he can be switched to the job for which he is best suited.

It may be argued, certainly in connection with points one and two, that it was up to the man to keep himself up-to-date, by reading technical literature and doing private work if necessary, to maintain his ability as a mechanic, and just to use his native intelligence in the realization of his purpose in life, as long as he was in the Air Force. Admittedly, that would have helped, but would still have been no substitute for applied practical work, and knowledgeable guidance. Again, it would be reasonable to ask, "What job did the man get when war broke out, and how did he succeed?" Well, at the outbreak of war, he was already doing the job of Squadron Signals N.C.O., but with a difference. He was on a Colonial unit which, starting with a nucleus of half a dozen R.A.F. tradesmen—I refer only to the ground staff—and a handful of week-end trained airmen, grew in a year to a full squadron

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engaged on Army co-operation duties. The whole of the training which accompanied the transformation was carried out on one of the remoter overseas stations, where facilities for other than practical instruction were nil, and the practical instruction had, perforce, to be carried out as a sideline to getting and keeping the squadron operational. It says much for the quality of its trainee material that the squadron won through. Well, our man did his best. He taught the wireless operators morse and procedure, air and ground operating, the manipulation of air and ground wireless sets, and sufficient about soldering, accumulators, motors and dynamos, and so on, for them to be capable of carrying out a certain amount of servicing. The W.O.Ms. he taught on much the same lines, but, naturally, he wanted to give them a thorough understanding of the equipment it would be their job to service. This is where he failed. His knowledge of radio was that of ten years before, and had not even been refreshed during that time. His mechanic's knowledge was almost confined to rule-of-thumb fault finding on a single type of equipment. How, then, could he instruct others, not only in the fundamentals of radio, but in the working of equipments which were almost as new to him as they were to his pupils? Moreover, he had never instructed, nor been shown how to instruct. Looking back now on his efforts, and contrasting them with modern instructor methods, I shudder.

So his record with the squadron was one of only part fulfilment of his duty. He was able to give his operators a reasonable training and teach both operators and mechanics the care and maintenance of the squadron pack-sets, which, fortunately, were made up of the aircraft equipment he had been using immediately before the war, but beyond that, he could not go. This story could be carried on, almost right through the war. Later on, he was to meet H.F. D.F. stations, efficient ground aerials, transmission lines, modern transmitters and receivers, all of which were strange to him, but—and what a but—all of which were commonplace before the war, and, therefore, should have been familiar to any wireless mechanic worthy of the name. I am given to understand that it was Air Force policy to rely on a man's initial training giving him such a grasp of the fundamentals of radio that for ever afterwards he should be able to understand the workings of any new equipment within a short time of meeting it. Here was a case where the policy was not justified, and it is my experience of the average pre-war trained mechanic that his grasp of radio is anything but sufficient to take every new development in its stride.

The case I have quoted cannot recur in its entirety, because the work of the old part-time air-gunner is now carried out by air crew employed on a full-time basis. It may be possible, however, for a man to confine himself, or to be confined to one job, or type of job, through many years of his service, and to turn out to be the very man the Service finds difficulty in placing in wartime—the specialist. To overcome this danger, a greater control over individuals must be exercised. It should not be possible for a man to escape being up to date by volunteering for this or that job, or this or that station. His personal record should not only be comprehensive, but should be conned periodically by some central authority, to ensure that the man is being adequately trained. In fact, his life should follow a syllabus, which should be constantly reviewed, just as much as a trainee on a course follows a syllabus. This does not mean that as every piece of new equipment comes into the Service, every man likely to be employed on it must be trained in its use, but it does mean that it must be impossible for any member of the technical branch to find himself, at any given time, ignorant of the majority of the equipment used in the Service, as has happened so often in the past.

Earlier, it was remarked that our man had been recommended for a cadetship, but, having been found medically unfit, he left the apprentice service as a L.A.C. Instead of being accepted for officer training there and then, he worked on as an airman for over ten years, and then was made an officer—without any officer training. An analogy is that of a young man in unhappy circumstances, having not many prospects, on the verge of death. If he goes over, he may be transplanted to the Elysian fields. If he stays this side, he has to plod along his old unhappy track, only to come to the same destination in the end, when the call comes. However, to be practical. How infinitely more useful to the R.A.F. our man would have been if, instead of being left as a L.A.C., he had been sent to some technical equivalent of the Royal Air Force College, there to be trained as a Signals Officer. After all, he had that something in him of which officers are made, else he would not have been recommended for a cadetship; yet, because he was unfit to fly an aeroplane, all that potential talent was wasted—his life left to run downhill intellectually, and the Air Force the loser, in its executive spheres, of someone of youth, intelligence, and unbounded enthusiasm. He, of course, was only one of many, and I would say that the Air Force was the worse off for every instance.

It may be that the case is not proved; that the man who is commissioned after long years in the ranks is as useful, if not more so, than the man

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who is trained to be an officer. So let us return to our example, and refresh our memories a little. After leaving the apprentice service, he spent nearly nine years, in four localities, working on two or three pieces of equipment; starved of literature, starved of knowledge, and starved of guidance. Outside his own job, he saw the ordinary ground communications equipment of small stations—and that is all. He heard, over a pint of beer, how an Army co-operation squadron worked, and what went on in the Fleet Air Arm, but mostly his life was circumscribed by his squadron.

What might have happened had it been possible to train him as a Signals Officer? As to his early training, presumably it might have followed much the same lines as that of the present-day ex-apprentice cadet who elects for the Technical Branch. If he came into the Service proper from the equivalent of Cranwell, he would have been a member of a *corps d'elite*, whose training in all branches of Service life is surpassed nowhere in the world. His initial training finished, he would have entered the Service in the fullest sense. His horizon would have been unlimited; all that went on in the Services would have been made known to him; he would have been lectured to, he would have liaised, he might even have been the subject of an exchange with another Service or Air Force. In fact, he would have been treated as a useful member of the Service who was worth making the most of.

If the Technical Officer is to be looked upon as a superior foreman, then the man commissioned after long years in the ranks is the answer. If, however, the Technical Officer is to be a man who can fill high staff appointments, with the wide knowledge and breadth of vision which those posts call for, then he must be trained properly from the start. By all means let him do a spell in the ranks; that may be just as important a part of his training as might be a knowledge of the tactical applications of radar—but do not let him stay there for more than a couple of years. However, that subject has now been dealt with by the Air Council. We have a Technical Branch, and we have the right men being selected at the right age for entry into the officer posts.

An extension of both these lessons which has come to me since the end of the war is, that to be commissioned without receiving any officer training, either technical or administrative, is to find oneself at a disadvantage. From what I have seen of them, the Signals Officers who have been commissioned after having done the Signals War Course, and the pre-commissioning course, are much better equipped for their job than those who have not had the courses. I imagine, too, that the nine months of intensive radio training which made up the Signals Course was a tacit admission, on the part of the powers-that-be, that their signals tradesmen were sadly neglected during the pre-war years, and did, in fact, require almost retraining, technically, quite apart from being brought up to date as regards equipment.

To summarize, then, the lessons I learnt are these. Airmen of the Technical Branch must be kept up to date, at no matter what expense—it will not be much, and will be cheap in the long run. The detailed means of doing so are open to discussion, but I would suggest periodic tests of a man's knowledge, and, where found necessary as a result of the tests, refresher courses. There should, in any case, be refresher courses for everybody, if only to widen the outlook of the would-be specialist. Secondly, the exercise of good officer qualities in the R.A.F. during the war was not confined to those who were medically fit to fly, so there would seem to be no reason why the same should not hold in peace, or in the next war. There seems to be no reason, therefore, why ex-apprentices should miss careers, and the Air Force should be deprived of their talents, merely because they cannot pass a pilot's medical board. And, finally, no man should be commissioned, in peace or war, unless he has been kept right up to date throughout his service, or has, recently and succesfully, passed a course which has achieved the same end.

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A Versatile Lady

By Air Vice-Marshal E. D. Davis, C.B., O.B.E.

Introducing the Lady

WOULD you have the patience to suffer the reminiscences of a Silly Old Blighter as he recalls incidents of some twenty-five years ago? If so, let me apologize forthwith for the misleading title, as the story has nothing to do with the vagaries of a voluptuous vamp, but rather does it concern an episode in the life of a little ship. Let me hasten to add that, thanks to an ambitious paperhanger, all my *aides-mémoire* such as log books and photographs have been destroyed. Therefore have I to rely on memory alone, so please forgive me, knowledgeable reader, if incidents are a little out of step or references misquoted.

In the brief period between June, 1922, and October, 1923, we were called on to perform many and varied tasks, some of them not without excitement and some unique in the history of the Junior Service. I will leave the reader to deduce any lessons or to make modern comparisons, so let me now pursue the narrative and start by describing the ship.

Originally she was s.s. *Stockholm*, plying on the Great Eastern Railway route from Harwich to the Hook, but in 1915 she was taken over by the Admiralty, converted to a seaplane carrier and christened H.M.S. *Pegasus*—"Peggy" to all who knew her. She was of three thousand tons, knocked up about twenty knots and carried five seaplanes, with wings folded, in her after hangar. The aircraft had to be spread on the after deck, which could take only one at a time, and then lowered over the side by electric cranes. Her complement was about 200, of whom fifty were R.A.F., and the wardroom had a happy balance of Navy and Air Force types numbering thirteen of each. In addition, we later had the first four naval officers who had been trained as air observers. They were grand fellows and a great asset to our company. During the period I describe we were equipped with Fairey IIID three-seater seaplanes having a cruising speed of about 90 knots and five and a half hours' duration. "Peggy" had seen service with the Grand Fleet, in North Russia and in the Black Sea, but the sphere of operations which this story covers is the Eastern Mediterranean.

I must also say a word concerning the prevailing political set-up in that part of the world. The Anglo-Turkish Armistice had been signed, but peace negotiations were still in progress. The Dardanelles and Bosphorus had been neutralized and the neutral zones were garrisoned by totally inadequate British forces. The Greeks and the Turks were still at war, and the former had penetrated Asia Minor to a depth of about 150 miles, the line extending from the Sea of Marmora to the Mediterranean. At the time this narrative opens, the Turks under Mustapha Kemal, were preparing for a counter-offensive, which would drive the Greeks westwards into the sea. So now the stage is set for the story proper.

* * *

In June, 1922, we were lying off Jaffa during a normal summer cruise, when we had instructions to proceed to Haifa, where we would be joined by three destroyers for Operation "Gun-running." It was known that arms were being supplied to the Turks through the Palestinian ports, and our job was to maintain continuous air sweeps by day to a distance of thirty miles out to sea to intercept suspicious-looking caiques. However, many interceptions were made and at the end of ten days not a caique was to be seen on the horizon; probably the news had spread and instead of using the Palestine coast they had turned northwards and concentrated on the Syrian route. Our job was thus completed.

It might be of interest to recall that our southernmost turning point was Ashdod, shown on the Admiralty chart as a port with a small jetty. Several aircraft overran this turning point, as no jetty could be located, but a special reconnaissance showed Ashdod three miles inland, the ancient harbour completely buried by sand blown from the desert. It would seem that many moons had waxed and waned since the Admiralty last surveyed this little-used stretch of the Mediterranean.

From Haifa we were sent to Constantinople, where we enjoyed a short period in that delightful resort on the opposite shore of the Bosphorus known as Moda Bay. Everything was peaceful at this time, but one instance comes to mind which will indicate our permanent "state of readiness." One Sunday afternoon, with everything closed down, we suddenly received a signal from the *Emperor of India* saying "Am awaiting aircraft for spotting exercise." This was our first intimation of the requirement, and immediately "R.A.F. Duty Watch" was sounded. The evolution in launching the aircraft included furling the after awnings, down stanchions, open hangar doors, out and spread aircraft, test engine, install

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and test wireless, and launch over the side. From the time of receipt of signal to the aircraft being at a thousand feet and in communication with the *Emperor of India* was seventeen minutes. This was the only occasion on which we failed the other Services, and the fault lay not with us but on the part of the Naval Traffic Office, which omitted to pass the original signal.

From now on tasks gradually increased in intensity. To start with, they were confined to simple reconnaissance for the Army in photographing the defensive posts which were being erected along the neutral boundaries, but early one morning we received a signal to search the Sea of Marmora for the Greek Fleet, which had been at anchor in the Bosphorus but which had crept out unseen during the night. The fleet was located lying off Brusa, which was the extreme left flank of the Greek line. A full-scale battle was in progress, and, as the Greeks were getting the worst of it, the Greek Fleet had gone to their support. On reporting the position of the Greek Fleet a British cruiser was dispatched, "collected" the Greek Fleet and led it back to Constantinople under our air cover. To this day I am uncertain of the ethics of the case, as it was the Greeks' private war, anyhow.

After this episode we were diverted to the Dardanelles, and we anchored off Chanak. This was of particular interest to me, as I had been through the Gallipoli campaign as a machine gunner and welcomed the opportunity of not only flying over the area but also revisiting old battlefields.

Our task here mainly consisted of neutral zone patrols, but we suddenly had another interesting diversion. The British force at Chanak consisted of a small detachment of the Highland Light Infantry with a platoon stationed seventy miles up the Dardanelles at Karabigha, but General Headquarters decided to concentrate all available forces in the Chanak area. As the going by land was circuitous and arduous, we were dispatched to evacuate the platoon, including one horse and one wife, in that order of precedence. This was done in a matter of a few hours and we returned to Chanak.

By this time the Greeks were definitely getting the worst of it and were literally being driven into the sea at Smyrna and elsewhere, so that the Turkish forces constituted a definite threat to the neutral zone and the passage of the Dardanelles. Reinforcements were on their way from home, but, in the meantime, something had to be done to help the Highland Light Infantry ashore in the preparation of defensive positions round the town. Such assistance was found by detailing every available sailor and airman to act as a shore party to dig and man trenches, and I venture to suggest that it forms the first if not only occasion in history when all three Services have acted under the command of a junior R.A.F. officer as a composite land force.

The British forces ashore were growing in strength, and calls on our limited resources for reconnaissance and other co-operation were frequent and varied. One which I remember distinctly concerned a combined shoot by a 4.5 howitzer battery, a 6-inch shore battery manned by the Royal Marines, and a 15-inch shoot by a battleship, firing indirect across the peninsula, all guns engaging a common target. But here was the joke. For spotting, the Army wanted the "clock code," the Royal Marines insisted on "distance and bearing," whilst the Navy demanded "shorts and overs, and rights and lefts." I was the unfortunate spotter, and, although every effort was made to time the salvoes accurately, I will defy any observer to use three distinct codes almost simultaneously on a common target. The result, I regret to say, was not merely disappointing—it was chaotic, and the need for a common code most obvious. However, at Combined Headquarters in Constantinople, the higher powers-that-be went into a solemn huddle on this point and after a lapse of nine months—a little late perhaps—a code was evolved. I would mention that the unhappy spotter (myself) was not asked to be present at this highbrow gathering.

Other minor tasks which we were allotted and which were a drain on our limited resources were reconnoitring for and laying out of aerodromes, and a regular mail-cum-V.I.P. service between Constantinople and Chanak, with occasional runs to Smyrna, where there was a small naval force. On one of these runs a V.I.P., to wit, an Admiral, lost his service cap over the side in the middle of the Sea of Marmora. Being midsummer, white cap covers were being worn and we had to undertake special reconnaissances to locate the said cap, which, it was thought, would be most apparent against the blue and calm sea! Of course, finally, he had to rely on Messrs. Gieves for a replacement.

The general situation was rapidly deteriorating and we extended our neutral zone patrols down the coast of Asia Minor and along the Gulf of Edremid, looking for Turkish columns which might be approaching. At last such a column was located well to the south of Smyrna, and at this stage the balloon nearly went up. As the Turks approached the neutral boundary, the excitement became more intense. All aircraft were kept fully armed and the ships moved to battle stations, their guns being trained on pre-selected

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targets. The senior ship, H.M.S. *Centurion*, hoisted the Blue Ensign at the dip as a preparatory signal; if hoisted close up it meant war. Signals were flashing between the C.-in-C. and London, though this did not ease the immediate tension. The Turks opened fire on our aircraft, some of which were hit, though no casualties resulted. Under such conditions it would have been quite understandable if, in retaliation, an odd bomb or two had been dropped, in which case hostilities would have definitely broken out, and the unfortunate air observer would have found a minor war debited on his next month's mess bill. However, after much parleying between the Turkish commander and British representatives at the neutral boundary, the Turks were allowed to enter and occupy the zone—a complete climb-down for Allied prestige. But I well remember the anxious looks towards the Blue Ensign whilst the tension lasted, especially as the British forces in the area were very much in the minority.

An incident occurred about this time which well illustrates the prevailing naval outlook towards the ownership of the R.A.F. afloat. On a rather nasty day with a very unpleasant and choppy sea, the Captain sent for me, in the absence of our R.A.F. C.O., and stated that the Brigadier ashore had asked for an urgent reconnaissance. Could I, requested the Captain, fulfil this requirement without endangering the Admiral's aircraft? I replied that if the Army wanted support we would give it to them, as the R.A.F. was there to help either Service and we (the R.A.F.) regarded H.M.S. *Pegasus* purely as a means of conveying us to the theatre of operations. The flight was duly conducted and that evening the Captain again sent for me. Over a glass of sherry he said that he had been thinking over my comment and he quite agreed. In fact, he added, "You're quite right. H.M.S. *Pegasus*, which I command, is only an R.A.F. pantechnicon." From that time onwards there was never any question whether an aircraft was wanted for Army or Navy purposes.

A little later we returned to Malta for refit, and on passage down the Dardanelles we passed H.M.S. *Centurion*, who made a signal: "Captain to Captain. Cheerio. Hope you enjoy Malta." Our skipper, who detested Malta, replied: "Thanks. Would prefer prison." Back came the answer: "Regret; have only experienced Malta." Gone are the days when the freedom of the air permitted such courtesies and flashes of ready wit.

On return from Malta we were sent to Buyukdere, which lies at the northern end of the Bosphorus. Our task was to maintain cloverleaf patrols to a radius of fifty miles into the Black Sea to locate a Russian submarine, which, it was thought, would endeavour to force the passage and torpedo Allied ships lying off Constantinople. This operation called for four aircraft in permanent use from 0500 hrs. until 1900 hrs., keeping our fifth in reserve or for other urgent commitments. We kept this up for over a fortnight, when, quite accidentally, we heard that the said submarine had been located ten days previously, well rusted up in Odessa harbour, so the threat had never existed. Due to an oversight, a cancellation signal had not been sent. I will leave it to engineer officers to visualize the servicing tasks in maintaining this intensity of flying with such limited resources and so remote from any fully organized base.

After Buyukdere we went back to Chanak, but by this time political negotiations were in progress and calls on our services were correspondingly reduced. During this lull we were requested by the A.O.C., Malta, to experiment with night-flying and landing technique on seaplanes. We chose a moonless night for the trials, which started at 0300 hrs., thus ensuring, if unsuccessful, that the aircraft had sufficient duration to await daylight. We tried landing by wing-tip flares, parachute flares, searchlights, and a line of lights along the ship at deck-level. The first three of these methods were entirely unsuccessful owing to dazzle and reflection from the water, but the fourth method proved possible. The main snag, however, lay in the design of the aircraft, as the pilot sat in the centre section and, at either side of him, just ahead of and at eye-level, were the fishtail ends of the exhaust manifolds. When throttled back, these exhaust manifolds gave forth intermittent sheets of dazzling white flame which temporarily blinded the pilot, so we abandoned any further attempts at this experiment until a major technical modification had been introduced. Whilst the trials lasted, however, there were moments of distinct unpleasantness, not to say fright. I believe this was one of the earliest attempts to solve night flying by seagoing aircraft.

Then followed another spot of excitement. We were giving a cinema show to crews of smaller ships when at half-past nine in the evening the First Lieutenant announced "Visiting crews return to ships forthwith. Raise full steam and secure for sea in half an hour." At 2200 hrs. we weighed anchor and were working up for 20 knots on our way down the Dardanelles. Dawn found us off Mitylene in company with the battleships *Resolution* and *Royal Oak* as well as a flotilla of destroyers. We got into battle formation and proceeded to Smyrna, and it was not until this juncture that we knew what it was all

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about. Lying in Smyrna harbour had been several small warships of Allied nations, and the Mayor of Smyrna, probably acting on higher authority, had told them to clear out quick. All Allied ships complied with this order, except H.M.S. *Calypso*, whose Captain signalled to the C.-in-C. that as he did not take instructions from a Turkish mayor what were his orders, please? The result was this show of force.

As we steamed down the Gulf of Smyrna a kindly Turk from the shore defences signalled that the passage was mined. Paravanes were streamed and we launched aircraft, fully armed up, to reconnoitre ahead of the fleet and to demonstrate over the town. In a short while the fleet fetched up "all standing" right at the entrance to Smyrna harbour. Boats were lowered and the senior naval officer went ashore with a large armed escort of marines and sailors to pay a courtesy call on the mayor. Such call having been made, though not returned, the mayor rescinded his order and the incident was over, but when you think of it the poor mayor had but little option, as there were sixteen 15-inch guns plus innumerable weapons of smaller calibre and an effective number of aircraft sitting right on his doorstep. That afternoon, all the Allied warships which had scuttled out in the morning duly returned.

After this followed the worst period I have ever experienced in the Service. We lay off Smyrna harbour for three weeks; we were not allowed to fly, we were not allowed ashore, and, in fact, we could just do nothing, even inter-ship visiting being prohibited. This inactivity had a most demoralizing effect on all personnel.

However, even bad things have to end, and on our return from Smyrna we were diverted to Mitylene for a most interesting and unique job of work. Some months previously H.M.S. *King George V* had touched an uncharted rock in the Gulf of Edremid, and our task was to locate the rock, take soundings and establish its position. For this purpose our base was Port Iero, that delightful, land-locked stretch of water, approached by a narrow and tortuous channel. We had to wait several days for favourable conditions, but at last the weather cleared and we had blue sea and blue sky. It was only a matter of a day's reconnaissance to locate the rock by visual means and to confirm by photography. After this, aircraft conned a motor-boat over the rock, where soundings were taken by our navigator. The result was signalled direct to the Admiralty, and in reply we were thanked and told we had done in three days what would have taken at least three months by a survey ship. Furthermore, the Admiralty, who were always chary of accepting such reports unless conducted by a hydrographer, relaxed on this occasion and recorded "Position Established" as against the more usual "Position Doubtful." This, I believe, was the first hydrographic survey in which aircraft played a major role.

Back we went to Constantinople for the closing scenes of the Chanak incident. At long last peace negotiations between Britain and Turkey had been concluded and agreement reached over the Dardanelles question. As a parting gesture it was agreed to give an air display at San Stefano aerodrome for the benefit of the Turks. All British squadrons took part, including "Peggy's" aircraft. Our role, amongst others, was a formation landing and take-off in San Stefano Bay, a pretty sight with the wash and feathering of ten floats. It was a bit tricky, as we had to approach over cliffs about 100 feet high, land and take off again in three-quarters of a mile and clear further cliffs at the far end. The display was booked for a Saturday and we held a rehearsal on the previous Wednesday afternoon. I was the leader of the formation, and although it was an ideal day with a calm sea I did not notice a nasty swell running across the bay. I had to cut the approach as fine as possible; in fact, we came in at stalling speed.

There were four horrid crunches as we touched down (or should I say fell out of the sky?), and four aircraft immediately began to sink owing to punctured floats, but the pilots just managed to taxi ashore. The fifth remained afloat. I signalled the latter to return to ship thirty miles away for assistance. The pilot in question was not too sure of his own aircraft and decided to land "under the crane." It was a wise choice because, as he landed, his undercarriage collapsed as well and he was just hoisted on board in time.

"Peggy" weighed anchor at once and came to our assistance. That evening five very sorry-looking Fairey IIID's littered the after hangar and after deck. Needless to say, I was not at all popular with the R.A.F. Engineer Officer, and my wine bill for the month suffered accordingly.

There was only one thing to do and every man-jack set about doing it. Under modern conditions the aircraft would all have been considered either complete "write-offs" or "maintenance unit repair." But such terminology was unheard of in those days. Broken longerons were scarf-jointed or else completely remade from baulks of timber, new engine bearers fashioned, distorted engine bed plates straightened and reinforced, new metal box fittings made, undercarriage struts straightened and strengthened, floats repaired and aircraft completely rerigged. All this in a hangar where the aircraft had to be

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stowed with the wings folded or on the after deck where only one aircraft could be handled at a time. For two nights and days the hangar looked worse than a dog's breakfast with bits of aircraft littered all over the place, but on Saturday morning all aircraft were flight tested and the same afternoon took part in the display without incident.

A week or so later, during which period we gave every member of the ship's company air experience, the whole Mediterranean Fleet returned to Malta, where each ship was inspected in detail by the Commander-in-Chief. As usual after such an inspection, the C.-in-C. announced his "finding" by a general signal, so you may imagine that we were justly proud when the signal read: "The cleanest and most efficient ship in the Mediterranean Fleet is H.M.S. *Pegasus*." This indeed was a high honour to be accorded one of the lesser fry when in competition with her older, bigger and navally more important sisters.

Within a week or two we received sailing orders to proceed home for refit and recommissioning, and so, after a sixteen-month interlude which covered many activities, we left harbour with paying-off pennant flying and were given the biggest send-off I have ever witnessed. Every ship in Malta sent a contingent to escort us out of harbour, and the regiments with whom we had co-operated contributed with bands and guards of honour.

I might end this story on this high note, but there was an inevitable anti-climax due to lack of appreciation by the Air Ministry. The ship was to proceed to Plymouth for refit and the aircraft were to go to Lee-on-Solent for thorough overhaul. On the way home our aircraft crews worked like niggers to get the faithful old Faireys spick and span so that we could take off in the Channel, fly to Lee-on-Solent and arrive in what we considered would be a fit and airmanlike manner at the conclusion of such an interesting commission. But, no; 'twas decreed otherwise, and after having worked up to this state of enthusiasm our spirits were completely damped by instructions from the Air Ministry to proceed with the ship to Plymouth, dismantle the aircraft, pack them in cases and dispatch by rail, despite the fact that they were all fully serviceable. Perhaps the phrase "maintenance of morale" had not been invented then.

Thus ended the commission, and I think you will agree a commission full of grand variety. Apart from our normal duties of naval co-operation, such as spotting and torpedo running (not forgetting search for an admiral's hat), as well as practice in air gunnery and bombing, we had, over a period of sixteen months, stopped gun-running, surveyed and laid out an aerodrome, evacuated an Army contingent, dug and manned shore defences, undertaken a hydrographic survey, given the Army close and distant support, played police dog in search of an Allied fleet enjoying its own private war, maintained intensive anti-submarine patrols, conducted regular air-mail service, and experimented with night landing on water. Surely "Peggy," with her brood of five Fairey IIID seaplanes, was a versatile lady.

CIVIL AIR PATROL—
(*Continued from page* 128)

advantage that their chances of passing the rigorous Army courses were much improved. Due to the high cost of training Aviation Cadets, any reduction in the percentage of washouts meant a substantial saving; therefore, prior experience and training tends also to reduce accidents.

The status of Civil Air Patrol as an active flying organization makes it far more effective as a training corps than one founded for training alone. Members who train with the expectation of being called at any moment to guard an aeroplane wreck, or otherwise meet an emergency, have a constant incentive to learn the courses and the military team work that spells success or failure. The early units of CAP performed many missions in which their members and recruits may take special pride. It is this tradition and spirit that puts zest into CAP's recruiting and cadet training activities.

In the future, as in the past, the Civil Air Patrol stands ready to meet any local or national emergency which might arise.

Plans of CAP.—As it has been previously stated, the CAP intends to maintain a CAP Cadet Corps of 100,000 young men and women. Many Wings are increasing their membership through various methods. As an example, one squadron commander utilizes this plan: Each cadet of his squadron who recruits three new members receives a flight in the commander's privately-owned, twin-engined plane. Many new recruits have been added to the squadron by this method.

CAP's policy of accepting women on a basis of equality is particularly important. Before the war, barely more than 3 per cent. of the licensed pilots were women. Thus, the female half of the population, controlling far more than half of the purchasing power, had taken little part in aviation. Today women and girls make up some 20 per cent. of the membership of CAP.

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Civil Air Patrol History, Organization and Purpose

32D AMERICAN AIR FORCE BASE UNIT NATIONAL HEADQUARTERS, CIVIL AIR PATROL, BOLLING FIELD, WASHINGTON, D.C.

ORIGIN.—CAP was founded on 1st December, 1941, under the Office of Civilian Defence to mobilize the civil airmen of the country with their aeroplanes and equipment for war-time duties. The CAP Cadet programme was founded on 1st October, 1942. From the beginning of CAP, most of the active missions were flown for the Army Air Forces. Therefore, on 29th April, 1943, CAP was transferred to the War Department by order of the President.

Command.—Appointed by the Commanding General, United States Air Force, the National Commander, with a staff of Air Force officers and civilian employees, directs the activities of CAP. The National Headquarters is in Washington, D.C. (Bolling Field).

Organization.—With the exception of National Headquarters, a USAF-CAP Liaison Officer, an enlisted assistant, and a Civil Service secretary at each of the State Wing Headquarters, CAP is composed of civilian volunteers. A Wing Commander in each of the 48 States and the territory of Hawaii reports to the National Commander and directs all CAP activities in the Wing. The Wings are organized in Groups, Squadrons and Flights. In the Smaller States there are no Group Commands. A typical local unit is a Squadron of 50 to 200 senior members or a Flight of 10 to 60 members. Each senior unit may form a similar unit of CAP cadets.

History.—Soon after the Patrol began to form its local units in the 48 States and to embark upon its programme of training at the beginning of the war, it was called upon to send aeroplanes and pilots on military missions. In the words of General of the Army, H. H. Arnold, Commanding General of the Army Air Forces during the war, "The Civil Air Patrol grew out of the urgency of the situation. The CAP was set up and went into operation almost over night. It patrolled our shores—performed its anti-submarine work—at a time of almost desperate national crisis. If it had done nothing beyond that the Civil Air Patrol would have earned an honourable place in the history of American air power."

Early in 1942, when German submarines were attacking American vessels within sight of our shores and were cutting the vital supply lines to our troops and allies, the Army and Navy did not have enough aeroplanes and ships to guard the coastal waters. CAP volunteers brought their aeroplanes and equipment to organize three experimental bases to find the enemy and call the bombers to the kill. They were unarmed, but the CAP airmen kept their secrets so well that U-boats about to attack convoys crash-dived on the approach of CAP planes.

After this success, 21 bases were manned, developed and equipped by CAP to cover the entire Atlantic and Gulf coasts from Maine to Mexico. Bombs and depth charges were slung beneath the light civilian planes which were in radio contact with their bases. Skimming the water in pairs, these single-motor aeroplanes were on daylight watch over the coastal shipping lanes, often as far as 100 miles at sea in winter weather or over high waves, when the failure of an engine meant almost certain death. In this service 26 CAP men were lost, while hundreds of survivors of ship sinkings and dozens of Army and Navy airmen down at sea were rescued when spotted by CAP observers.

Aircraft of the CAP Coastal Patrol were flown more than 24,000,000 miles over water. They spotted 173 submarines, dropped bombs and depth charges against 57, and are officially credited with sinking or damaging at least 2, in addition to those destroyed by aeroplanes or ships summoned by CAP. They found 17 floating mines, some in the path of troop convoys. The coastal patrol continued until 31st August, 1943, when the Navy and Air Force took over.

From similar bases inland, CAP pilots and observers flew 30,000 aeroplane hours along the Rio Grande to observe illegal crossings in either direction and to report irregularities. They flew so low that they could read auto licence numbers. Their radio reports resulted in many arrests.

For the Second Air Force, CAP aeroplanes flew more than 20,000 miles per day throughout the West to carry military mail, repair and replacement parts and other urgent shipments between widely separated air bases. At many Army fields in other areas, CAP aeroplanes were assigned to carry rush shipments when needed.

CAP has performed more than 20,000 missions as air participation in anti-aircraft gunnery training of the East and Western Defence Commands. On these assignments, CAP aeroplanes flew over

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46,000 hours towing aerial gunnery targets and tracking for guns and searchlights.

CAP aeroplanes and ground parties may be called into action upon request by the USAF when miliary aircraft are reported missing, especially in mountainous, desert and wooded terrain. CAP pilots and observers, flying low and slowly in their light aeroplanes and trained in methods of precision reconnaissance, find what they are looking for. Many aeroplane wrecks have been spotted, guards posted and aid given to survivors. CAP aeroplanes have flown over 24,000 hours on official search missions and much more on their own.

Inspection of camouflage and smoke screens, exercise of the Aircraft Warning System in the South-East, radar training flights and other special missions were flown to relieve Army aeroplanes and personnel for combat duty. In its military flying CAP lost more than 50 men and 150 aeroplanes.

Present Mission.—One of the chief functions of the Civil Air Patrol is the training of American youth in the fundamentals of aeronautics. In the United States and the territory of Hawaii, which make up the 49 Wings of the CAP, there are about 75,000 boys and girls between the ages of 15 and 17 participating in the CAP Cadet Training Programme. They are given ground training by the approximately 35,000 senior members of the CAP. The aviation subjects included in this ground training are map reading, theory of flight, meteorology, navigation, aircraft structures, engines, instruments, crash procedure and Civil Air Regulations. These are far more subjects than are required for a private pilot licence. Military subjects taught the cadets include infantry drill, safeguarding military information, guard duty, military correspondence, and organization of the United States Air Force. CAP does not give flight training but encourages all members to learn to fly by purchasing flight time from private operators. In many areas funds have been donated to give flight scholarships to outstanding members. CAP cadets are given orientation flights in L-4 type aircraft on loan to the Civil Air Patrol from the USAF. CAP pilots take special flight proficiency courses and observers go aloft to gain experience for emergency duties.

Instruction is given without charge by CAP members and other local volunteers best qualified to teach the various courses. Navigation may be taught by a commercially rated pilot; radio by a skilled amateur or professional operator; first-aid by a doctor or Red Cross instructor; and military drill by a veteran of the recent war or World War I. CAP training is a liberal education. Members who can fly broaden their aviation knowledge and learn the related ground subjects. Non-flyers learn about aviation.

A USAF Liaison Officer is assigned to each CAP Wing for consultation, advice and assistance in training problems and in the organization of training programmes. These officers, most of whom are combat returnees, may be called upon to advise instructors and CAP officers administering the training programme. They are available to discuss training methods and teaching techniques. They are the direct liaison between the USAF and the Civil Air Patrol in that a ea.

Each year the cadets are given the opportunity of attending one of the many summer encampments held at various USAF fields throughout the country. The encampments are approximately two weeks long. During that time the cadets put to practice the theory they have been taught in their ground schools. Seperate encampments are held for the girl cadets who receive the same privileges that are afforded the male members.

Tinker Field, Oklahoma, had the distinction of being the only field offering the CAP cadets a course in the maintenance of the jet engine (J-35). The course included 22 hours of classroom theory and 38 hours of actual assembly and disassembly.

Aerial Home Guard-CAP takes an active part in emergencies. Each local unit is prepared to work with military, State, municipal, or relief authorities to give whatever aid may be rendered through the aeroplanes, radio equipment, cars and personnel of CAP. They co-operate with many public agencies such as the Civil Aeronautics Administration, the Coast Guard, the Federal Bureau of Investigation, and the American Red Cross to be useful wherever possible, both in the air and on the ground. In emergencies caused by floods, tornados, hurricanes, blizzards, fires, explosions, or railway wrecks, CAP has saved many lives and has averted extensive property damage. In floods, CAP pilots fly to drop warning messages, observe the extent of damage and spot persons or livestock in distress. In addition to searching for missing military aircraft, CAP personnel often hunt for missing civilian aircraft.

Air Power.—The ultimate goal of the CAP is to have 100,000 highly-trained flying and technical personnel who, should an emergency arise, will be qualified and readily available to fill positions in commercial and military aviation.

From experience in the last war it was found that young men with a basic knowledge of military training had a great advantage over raw recruits. Those who had completed courses in such subjects as Morse Code, aircraft identification, meteorology, and navigation, had such a definite

(*Continued on page* 126)

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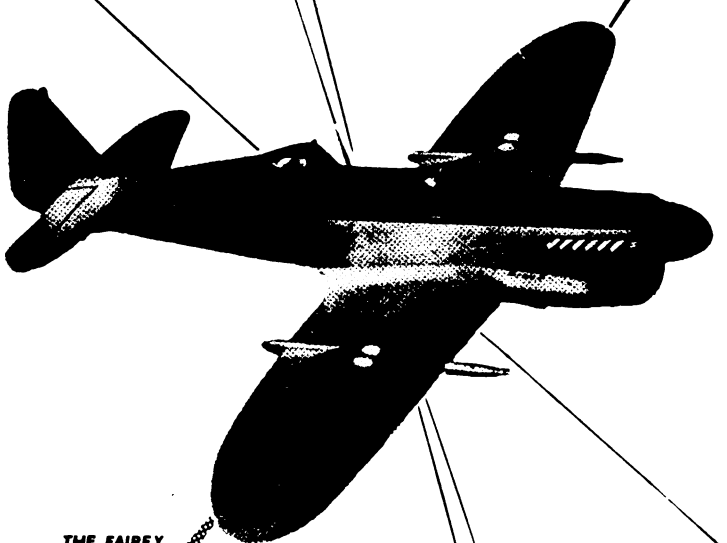

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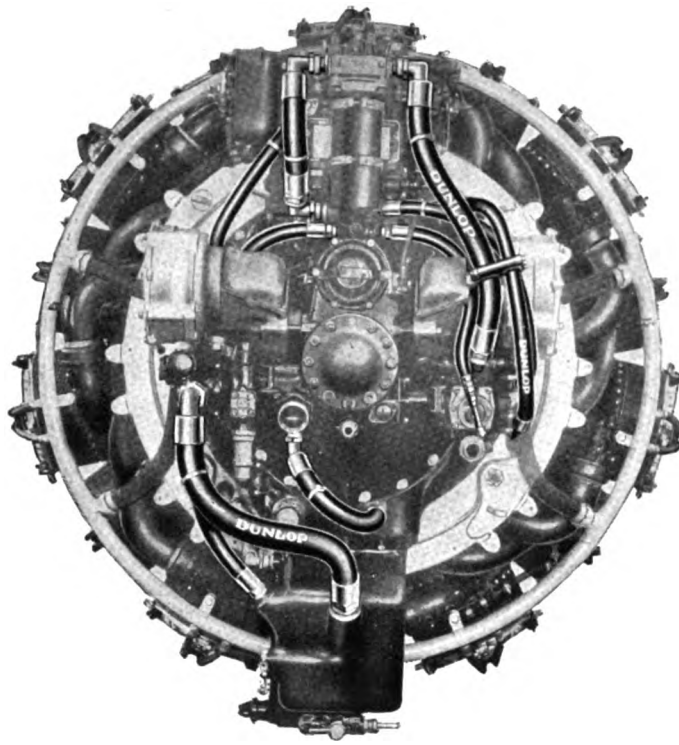

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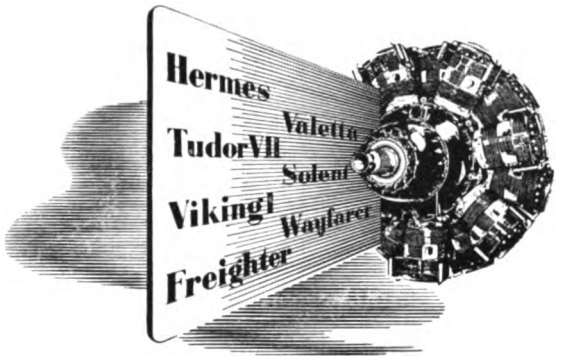

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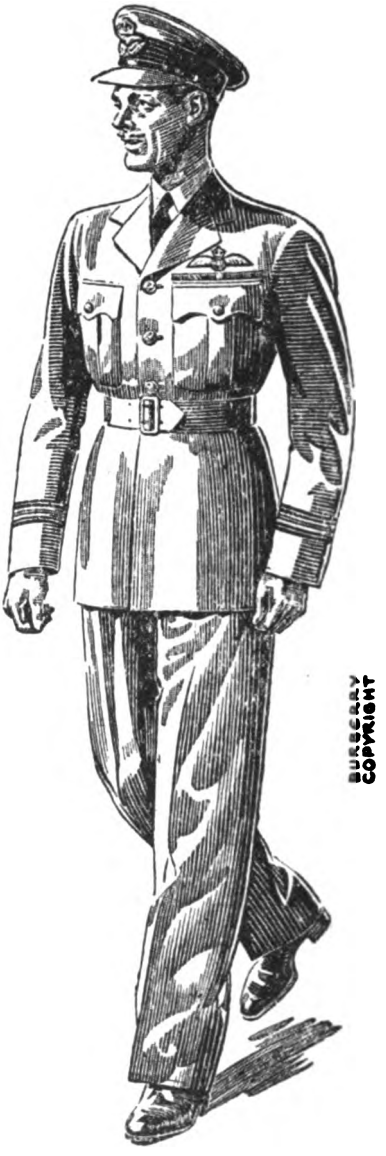

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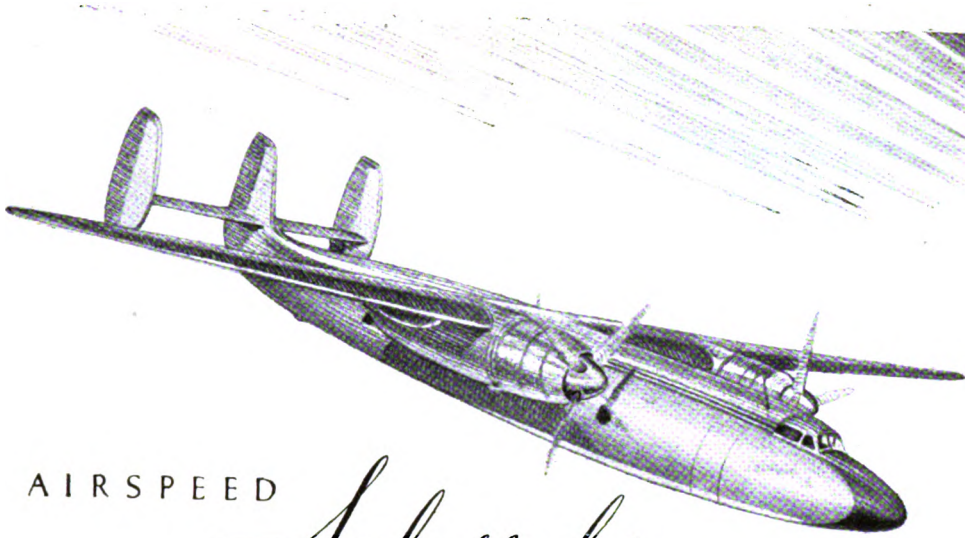

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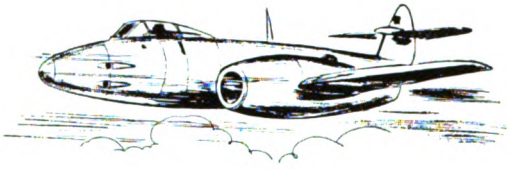

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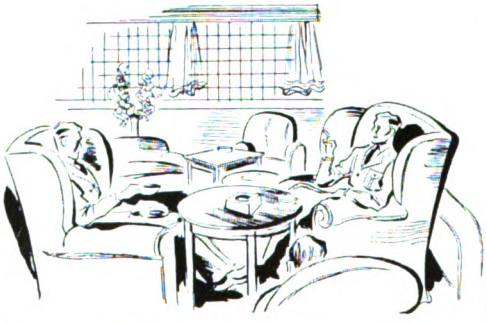

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EDITORIAL

The Defence of Western Europe

AS was foreshadowed in the last sentence of Squadron Leader Pemberton's article on "A Union of Western Europe," which appeared in the April number of this Journal, considerable progress has since been made towards the consolidation of Western Europe.

The Treaty of Brussels, of which the full text is reprinted elsewhere in this number, provides for mutual defence and economic co-operation between the United Kingdom, France and the Benelux group for fifty years; it considerably strengthens the bonds of friendship and common interests which already unite these five nations; and it constitutes an appropriate foundation for the future Union of Western Europe. And now that Italy has shown her independence of Communistic influence, she may be expected to accede to it in due course.

By its economic clauses, the contracting parties agree so to "organize and co-ordinate their economic activities as to produce the best possible results by the elimination of conflict in their economic policies, the co-ordination of production and the development of commercial exchanges." This policy is in harmony with the Marshall Plan; but it is not intended solely to fulfil the obligations of the five nations under the European Recovery Programme, as it also contemplates and allows for economic agreements between the five nations beyond the scope of E.R.P.

The military clauses of the Treaty (Articles IV, V, VI and VII) have been carefully framed to conform with the provisions of Article 51 of the Charter of the United Nations which safeguards the right of member-states to organize "individual or collective self-defence," and with Articles 52, 53 and 54, which recognize the need for "regional arrangements." Article IV, the principal military clause, provides that if any of the five signatory nations "should be the object of an armed attack in Europe, the other . . . parties will . . . afford the party so attacked all the military and other aid and assistance in their power." It will be noted that the phrase, "an armed attack *in Europe*," covers any aggression against any legitimate interest of any of the five allies anywhere on the continent, and not only in their own territory. A Consultative Council in continuous session is provided by Article VII. This "Council shall be immediately convened, at the request of any of the . . . parties," to enable them "to consult with regard to any situation which may constitute a threat to peace, in whatever area this threat should arise." In this Article, the possibilities of "renewal by Germany of an aggressive policy" and of "danger to economic stability" are specifically mentioned.

The Brussels Treaty is significant because nothing of its kind was framed after World War I; because it goes much farther than the Treaty of Dunkirk (March, 1947); because it entails the abandonment of their traditional neutrality by the Low Countries; and because it recognizes that Great Britain can no longer be isolated from continental affairs. To quote a leading article in *The Times*, of 18th March, "It stands for the recognition of a common danger that is present in revolutionary forms both within and without, and of the need for efficient means of self-defence."

Five-Power Military Committee

In addition to the Permanent Consultative Council (composed of the five Ministers of Foreign Affairs) already provided for, it has since been decided to set up a Permanent Military Committee to deal effectively with all threats to Western Union in general and to the signatories of the Treaty of Brussels in particular. To this end a Conference of Defence Ministers was held in London on 30th April, 1948. It was attended by Mr. A. V. Alexander (Minister of Defence), the Chief of the Naval Staff, the C.I.G.S. and the C.A.S. and their Staffs, representing the Government of the United Kingdom; the French Minister for the Armed Forces and his Chiefs of Staff; and the Defence Ministers of the Netherlands, Belgium and Luxembourg, with their Chiefs of Staff. Their duty was to set up the Permanent Military Committee which is to be responsible

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to the Permanent Consultative Council established under the Brussels Treaty. The general purpose of this Committee is to make plans for the co-ordination of the armed forces and resources of the five nations in anticipation of any possible threat to their peace and in particular to make proposals towards the standardization of the armaments and equipment of their naval, military and air forces and for the joint use of air and sea bases.

The potential military strength represented by the members of this Committee is considerable; but it is not at present developed to anything like its full strength, for the following reasons: (i) there is no common strategic staff to plan and direct its operations, and (ii) the fighting forces of the several States are by no means homogeneous, but dissimilar in staff methods, equipment and administration.

Just as the Brussels Treaty is a part of the implementation of the Marshall Plan, so the establishment of this Military Committee of the five Powers is in harmony with the defence policy of the U.S.A., whose government, while prepared to support the nations of Western Europe with military aid in the event of aggression, naturally require, as a first condition, that those nations shall co-ordinate their own defence organizations so as to present a resistance which can be supported. And it should be emphasized that this policy is a policy of defence. No one seriously accuses the Western European nations of aggressive intentions. But with a powerful and ambitious military State in Eastern Europe, a policy of military weakness in the West would simply be an invitation to further extension of communist influence. If a military power is set up in Western Europe comparable to that in the East, a balance will be established which will be a far more effectual guarantee of peace than any policy of appeasement; for a powerful nation which does not hesitate to extend its influence over weak neighbours, will hesitate and probably decline to attempt it when opposed by strength equal to its own.

UNION IN WESTERN EUROPE

Progress in developing the idea of a Union of Western Europe is remarkable. Such things usually take not only generations but centuries to come to fruition. And while it is not only premature but ill advised even to contemplate fruition at this stage, considerable satisfaction may be felt at the first formal steps that were taken in the first Congress of Europe at The Hague in May this year. It is fitting that Mr. Winston Churchill should be its Honorary President and deliver the opening speech, particularly as he is not now a Minister of the Crown and therefore cannot be regarded as representing His Majesty's Government, but is free and able to speak for the people of the United Kingdom and for the people of other nations who share his feelings. No one has done more, since the war, to foster the spirit of international unity than Mr. Churchill. At Fulton (Missouri) in March, 1946, he called for a closer fellowship between the United States of America and the United Kingdom; and at Zurich in September, 1946, he advocated some sort of union between the nations of Western Europe. And now, it would appear, his advocacy is having its effect. A Union of Western Europe is no longer an idle dream but a practicable proposition; the first tentative steps towards its realization are being taken.

Too much should not be made of these tentative steps; though there is no reason to doubt that they will eventually lead to some kind of union, the form of which cannot for a long time be predicted. For the necessities of the immediate situation, the Treaty of Brussels and the consequent co-ordination of the defence forces of the five signatory nations, are very much more important.

FUNCTIONS OF THE AMERICAN ARMED FORCES

The United States Administration announced in March, 1948, a new allocation of functions between the armed services of the Union. This was the result of long and patient consultations between Mr. Forrestal, U.S. Secretary of Defence, and his Chiefs of Staff. A summary of the new organization is given here as it will interest readers of this Journal and provide opportunity for comparison with the corresponding organization of our own defence services.

1. Each Service is assigned its own special and appropriate functions and it also has certain collateral functions.

2. The Joint Chiefs of Staff also have their functions, which are as follows:

   (*a*) To prepare strategic plans and to provide for the strategic direction of the armed forces, including the general direction of all operations.

   (*b*) To prepare joint logistic plans and assign responsibility for them.

   (*c*) To integrate joint plans for mobilization and review material and manpower requirements.

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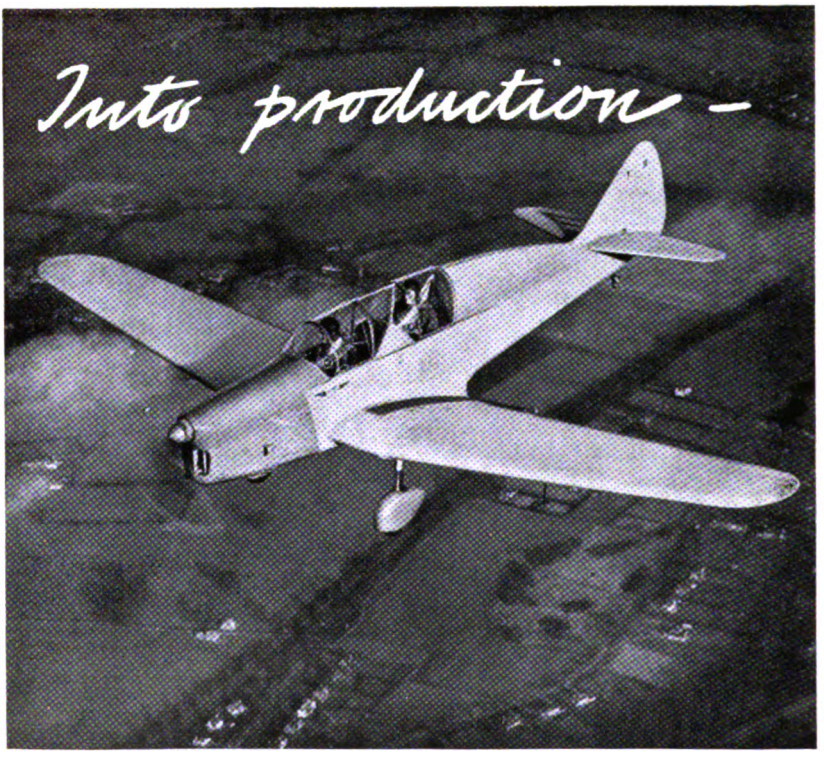

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(*d*) To participate in the preparation of combined plans with the armed forces of other nations.

(*e*) To designate the responsibility of one Service for unified commands, joint training and education schemes.

(*f*) To prepare and submit budgets for all forces.

(*g*) To provide the United States representation on the Military Staffs Committee of the United Nations.

3. The *primary* functions of the Army are:

(*a*) To organize, train and equip Army forces for the conduct of combat operations on land.

(*b*) To provide Army forces for the defence of the United States and for the occupation of territories abroad.

(*c*) To develop, with the assistance of other services, doctrines, procedures and equipment for airborne operations.

The *collateral* functions of the Army include:

(*d*) Interdicting enemy sea and air power and communication through operations on or from land.

(*e*) Providing the forces and equipment for, and to conduct, controlled minefield operations.

4. The *primary* functions of the Navy are:

(*a*) To train and equip the Navy and Marine forces for the conduct of operations at sea, including sea-based aircraft and their land-based naval and air components.

(*b*) To develop, with the assistance of the other services, doctrines for amphibious operations.

(*c*) To be responsible for naval reconnaissance, anti-submarine warfare, the protection of shipping and mine-laying.

(*d*) To provide sea-based air defence.

(*e*) To maintain the Marine Corps for the defence of advanced naval bases.

The *collateral* functions of the Navy include:

(*f*) Interdicting enemy land and air power through operations at sea.

(*g*) Conducting close air support for landing operations.

(*h*) Participation in the general air effort as directed by the Joint Chiefs of Staff.

5. The *primary* functions of the Air Force are:

(*a*) To train and equip air forces.

(*b*) To be responsible for strategic air warfare.

(*c*) To furnish close combat and logistical support to the Army.

(*d*) To organize and equip air forces for joint amphibious operations.

(*e*) To furnish aerial photography.

The *collateral* functions of the Air Force include:

(*f*) Interdicting enemy sea power through air operations.

(*g*) Conducting anti-submarine warfare.

(*h*) The protection of shipping.

(*i*) Aerial mine-laying operations.

6. Each service has the *collateral* function of supporting and supplementing the other services in carrying out their primary functions. Each has also as a *primary* function the provision of intelligence to its own forces.

(For the above details of the functions of the American Armed Forces, we are indebted to the Washington Correspondent of "The Times.")

THE THREAT OF WAR

It is natural to speak of the threat of a renewed outbreak of war for several years after the end of a great war. And the present international situation tends to foster that habit. For that reason it is well to examine carefully the prospects of war and peace, and so to avoid as far as possible conclusions that are not justified by facts.

International friction is being generated at present over the future of Western Europe. Shall Western Europe become subservient to the communist dictatorship like so much of Eastern Europe has become, or shall it remain free and

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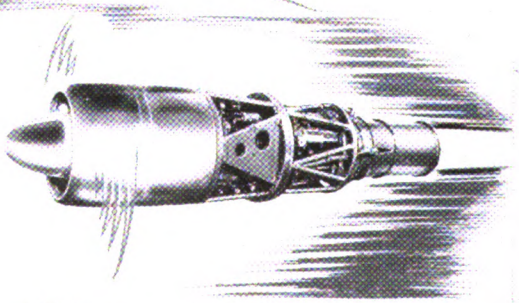

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democratic? If the latter, then it will have to become more united than it is at present. That is already being provided for, by the Treaty of Brussels (17th March, 1948) as a first step and by the Congress of Europe, whose first meeting took place at the Hague on 7th May, 1948. But a great deal depends upon the United Kingdom and the U.S.A. If these two stand firmly together and oppose the aggressive policies of Russia, then the nations of Western Europe will rally round them and, provided their military strengths are co-ordinated (as they appear to be going to be) and provided they can keep their communistic elements under control by steadily raising the standard of living of the poorer classes, they should be able to oppose to the U.S.S.R. a consolidated military strength at least equal to its own.

In such circumstances war is not impossible, but it is far less probable than it would be were one side very much stronger than the other. We may assume that no one wants war, but we must remember that both sides want something. The Eastern Power wants influence and the spread of communism; the Western Powers want freedom and to be left alone. And each of the two parties want what they want passionately; so that, if they cannot have their wish without going to war, they may consider a war worth while. And the decision apparently rests with Russia, for she may well become the aggressor, while it is quite unlikely that the Western Powers will fight until they are attacked.

What, then, is Russia's position? She cannot yet command the use of atomic weapons; but she possesses an enormous army, well trained and well equipped, and an air force not so good as the American and British, but good enough for a lightning advance across Western Europe. And her occupation of the whole (or most) of Western Europe would nullify the advantage which the Western Powers possess in having the atom bomb. The atomic bomb could not be used against enemy troops occupying a friendly country. It could, of course, be used on Russia herself; but then most of the Russian troops would have departed to the occupied countries.

As "Scrutator" points out in the *Sunday Times*, Russia has to decide whether to wait till she can command the use of atomic weapons on a parity with the U.S.A. or whether she will exploit her vast military preponderance in the near future. Her occupation of Czechoslovakia would appear to indicate that the latter is her intention, for Czechoslovakia is an excellent jumping-off place for an assault on Western Europe. And, if so, the Russian *coup* in Czechoslovakia must have been carefully timed to anticipate, by a calculated margin, the next event on the programme—the assault. And that, according to "Scrutator," would be due some time in August or September of this year.

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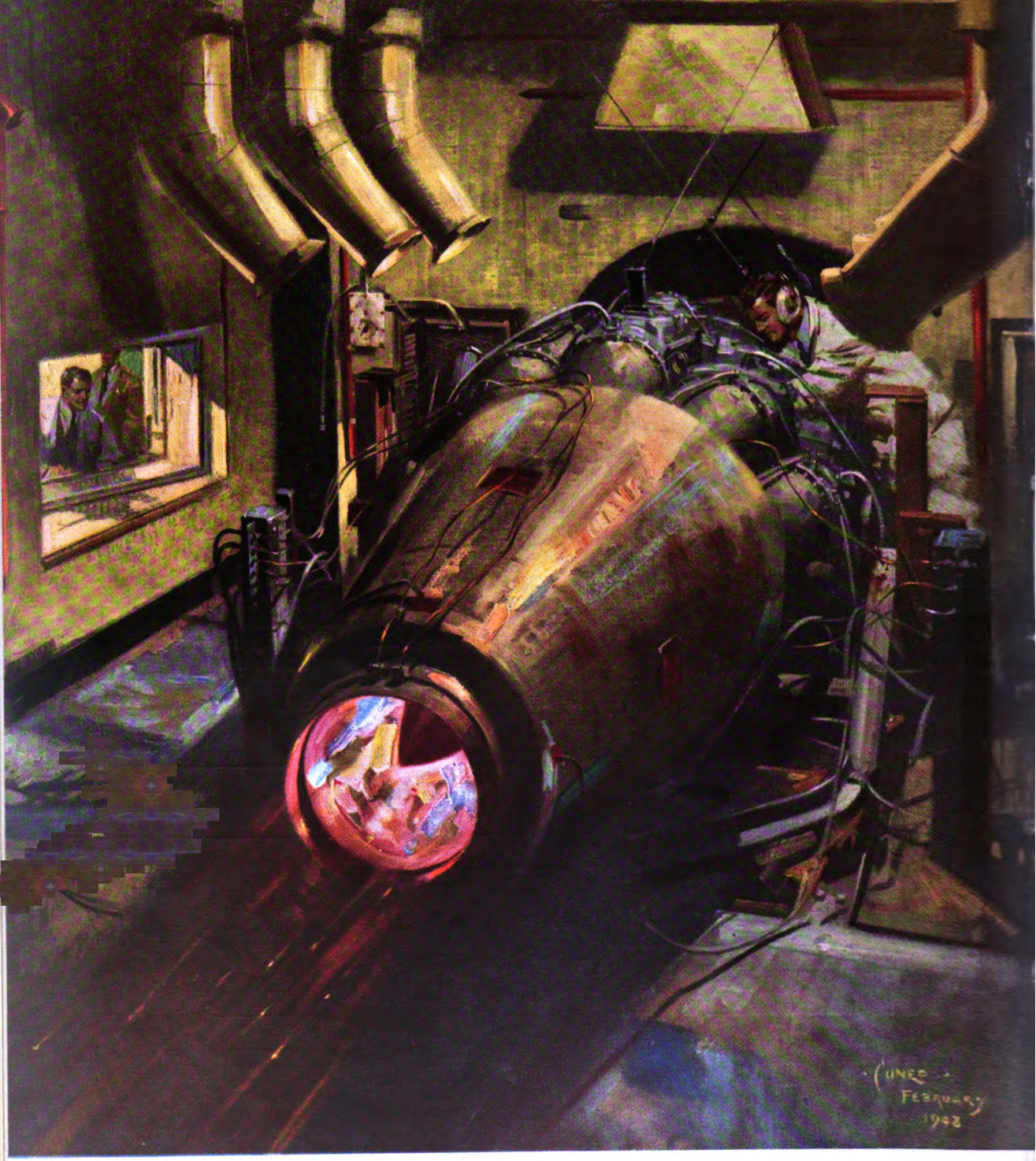

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Prize Essay

By Wing Commander J. B. Tait,
D.S.O., D.F.C., R.A.F.

"To what extent is it considered that the three Fighting Services could be amalgamated to achieve economy and to maintain, and possibly increase, fighting efficiency?"

Motto—"Unbind Prometheus"

I

THE thesis of this paper is that the evolution of war has now reached the stage where the greater part of war-like operations are conducted by all Arms in combination; that strategy is all-embracing and the arbitrary division of operations between land, sea and air no longer in concord with the nature of war, which was recognized in World War II and certain adjustments made to the machinery for the direction of the war; that the total amalgamation of the Fighting Services is now *necessary* to reconstruct the organization for defence to a form, better suited to wage a future war; that the fighting efficiency of the Armed Forces will be increased thereby and that economies will result which will reduce the burden of the Armed Forces on the nation.

The amalgamation of the three Services would not be a revolutionary change, but a further advance in the evolutionary process which began with the creation of the Committee of Imperial Defence in 1904 and is now passing through the stage begun by the establishment of the Ministry of Defence in 1946. Each of the previous steps has been taken tardily, almost reluctantly. The final, and biggest, step should not be delayed; it may be too late to undertake extensive reorganization when war is imminent and demands it.

This contention that previous steps have been delayed is supported by the history of the Defence Organization outlined in the White Paper, "Central Organization for Defence,"* from which the following paragraphs quote freely.

"The defects in our military machinery which were brought to light by the Boer War led to the appointment of Lord Esher's War Office (Reconstruction) Committee. . . The remedy proposed and adopted was the establishment of the Committee of Imperial Defence which came into existence under a Treasury Minute dated 4th May, 1904."

The next event was the World War I. "In 1914 we had well-laid plans for the transition from peace to war and machinery for concerting the actions of Government Departments in war. The Committee of Imperial Defence was not, however, designed to take executive control in war, nor had it developed any central machinery for inter-Service planning. The first of these defects was remedied by the establishment of the War Cabinet at the end of 1916 . . . . "

After World War I the need for inter-Service planning was filled by the creation of the Chiefs of Staff Committee and the Joint Staff system, which was developed in the period leading to 1939 and the outbreak of World War II.

"When Mr. Churchill became Prime Minister he assumed the additional title of Minister of Defence. . . . The duties of the Prime Minister as Minister of Defence were never defined. . . It was left to Mr. Churchill to develop a method of working through the Defence Committee and the Chiefs of Staff Committee which enabled him to provide the drive without which successful operations cannot be conducted."

These extracts evoke the conclusion that each of the last three wars in which we have been engaged found us at the outbreak with an inadequate organization for the supreme direction of the war. The Boer War was a minor Colonial war which did not demand much exertion from the country, but it discovered defection. World War I called for a change in the middle of the war by the creation of the War Cabinet. In World War II Mr. Churchill strengthened the organization when he became Prime Minister by assuming himself the supreme direction of the strategical conduct of the war.

There is support for the argument that a change in the organization for the supreme direction of war, after the conclusion or during the progress of a war denotes a flaw in that organization which would have better been eliminated before hostilities began. The greatly superior direction of World War II in comparison with World War I argues, apparently, that in this case there was no flaw; that omits notice of the peculiar fortune of our destinies in the rare and appropriate talents of the Prime Minister who took office. Mr. Churchill had been a soldier and brought in addition to the qualities of statesmanship of his political experience the fruits of a lifetime study of military strategy. The supreme direction of the war was the result of a man and not a system. There is a dissatisfying weakness in a system which depends on the forthcoming at a critical moment of a statesman who combines great abilities in the political and military sciences. It may be argued that the greatness of a nation is the sum of the qualities of its individual men and women and that a nation which cannot produce, at a moment of crisis, a great leader appropriately talented is no longer great,

*Command Paper 6923, October, 1946 (H.M.S.O.).

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and being attacked by corporate decay, cannot be saved by any system. Nevertheless there is, in the history of previous major wars indication that it should not be assumed that the whole burden of the government of the country and the conduct of a war can always be placed on one man.

In the Marlburian wars the conduct of affairs was divided between Marlborough and Godolphin: strategy was Marlborough's. In the Napoleonic wars our land operations went awry until Wellington assumed control; the Netherlands, Quiberon, Toulon and the West Indies were expensive fiascos for which Pitt is widely held to blame as an indifferent strategist.* Pitt had a poor instrument in an inefficient Army which he had neither the experience nor the power to rectify. But when the division of responsibility for government and military operations was restored, as it existed all along between government and naval operations, that success on land marched with supremacy at sea.

In World War I Mr. Lloyd George's relations with his Chiefs of Staff were not happy, which may be attributed to lack of military experience, to strengthen his position as sole co-ordinator of two Services, war production and the life of the nation. It was the first "total" war, and Mr. Lloyd George was the first of the country's leaders to understand its nature: the conception was fresh that the head of the Government should be ultimately responsible for strategic policy and that the management of the country's economy was as much a part of strategical policy as the conduct of military operations. He was not always able to impose his will on his Chiefs of Staff, although he did so on one notable occasion —the introduction of the convoy system.

There are now three Services and their operations are more closely related than before, but the organization does not provide a military head. The Minister of Defence may have had a purely civil and political career which would not have equipped him for directing strategy except in the most general terms, or to adjudicate between the separate and conflicting opinions and proposals of the three Services. The Chiefs of Staff Committee, which is the highest military authority, has been criticized by dividing up strategical problems between their land, sea and air components and considering each separately instead of the strategical problems as a whole, the claims of one Service being opposed by the other two.

The characteristic of committees in general is to agree only to the lowest common denominator of opinions. During the war the assumption of executive control by Mr. Churchill removed this weakness which was evident before the war; after the war the creation of a Minister of Defence was intended to prevent its reoccurrence. The principle has apparently been accepted that the Chiefs of Staff Committee must be surmounted by a single head, the apex of the triangular pyramid of the Armed Forces, and under the present system this office is filled by a Minister. In wartime it would probably be filled by the Prime Minister himself. The question is whether a Minister is the appropriate functionary. The duties of a Minister are partly departmental, partly Parliamentary. Adequate Parliamentary representation is necessary to any State Service, even in wartime when the authority of Parliament is partially abrogated. It is the responsibility of the Head of the Armed Forces to implement the strategical policy of the Government, to advise what forces are required or how limited resources can be best divided between the various Arms of the Services. The direction of the Armed Services and the study of military strategy are highly specialized subjects, and taking account of the fact that the Head of the Services is responsible for co-ordinating the functions of the different Arms and advising, if not deciding, on policy regarding the weapons which are to be adopted to fill the various strategic roles, it seems that the Head of the Armed Forces should not be a Minister but a serving officer. The responsibility for each of the Services is divided between a Minister and a Chief of Staff, and since this is the system of constitutional government it is logical that the new conception of the close relationship between the three Services should require it to be reproduced in the central organization.

The Prime Minister has the supreme responsibility for defence, but also for every other division of government; the whole business of government must be divided between departments, and subdivided between the Ministers responsible for the policy of His Majesty's Government and the executive Heads of the Departments responsible for implementing policy. The Prime Minister is not the executive head of each department by virtue of his responsibility for each. In wartime the Prime Minister has a special concern for Defence and may, as Mr.

* "They (the British Ministers) poured their troops into these pestilential islands in the expectation that thereby they would destroy the power of France, only to discover when it was too late that they had practically destroyed the British Army."—Fortescue, N., p. 385.

Trevelyan comments: "He (Pitt) accordingly hoped to fight as his father had done before him, for naval supremacy and colonial conquest, while sending over a few British troops and much English money to enable our allies to maintain themselves in Europe. But he had not his father's genius for war; it was a very different France with which he had to deal; and there was no Frederick the Great—at least not on our side." —History of England (Second Edition, p. 574).

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Churchill did, assume direction, but that does not invalidate the argument for a supreme Chief of Staff as chief executive. The division of responsibility between the Prime Minister and the Chief of Staff will depend on the Prime Minister in office, but there would be provision for that division between the functions of government and strategical direction which has been the more frequent occurrence in the past, while leaving open to the Prime Minister the option of assuming strategical direction if he so decided.

The creation of a Supreme Chief of Staff would, however, introduce fresh weaknesses unless it were accompanied by, and were a result of, the amalgamation of the three Services into one. The German system of a Supreme General Staff (the Oberkommando der Wehrmacht) failed because it was a combination of both systems, a single directing staff with separate Services, and had the disadvantages of both. Direction was divorced from execution. It would be unsatisfactory to appoint an officer of one of the Services as the head of all three; his experience would have been almost totally that of his own Service. The amalgamation of the Services would result, however, in officers gaining experience of all Arms progressively as they advanced in rank, as at present officers gain wide experience of their particular Service, and with the passage of time after amalgamation officers rising to the most senior ranks would be possessed of wide experience of all Arms.

II

Modern war is fought with combinations of Arms, exploiting the development of aircraft and the application of science and mechanical engineering to warfare. It is fought over very large tracts of country; the range and speed of the mechanical weapons will spread a battlefield over several countries and their adjacent seas, involving all the Arms—land, naval and air. The conception of a theatre of operations in which a territorial campaign is fought with forces of all the Services, the result of this extensiveness of the battlefield, reached maturity in World War II with the appointment of Supreme Commanders, formal acknowledgment that strategy is indivisible.

The various operations of World War II can be divided into several main categories: Theatre operations such as those of the North-West Europe, Mediterranean, South-East Asia and Pacific Theatres; air defence, such as the Air Defence of the United Kingdom; defence of sea communications, such as the Atlantic; strategic air offensives, such as the Bomber Offensive against Germany and Japan. Each of these types of operations was fought with combinations of several or all Arms; the theatre campaigns with forces of all Arms; the defence of sea routes with naval and air forces; air defence with fighter aircraft and anti-aircraft artillery.

In all these operations the principle of single direction of strategy was accepted. The theatre operations of North-West Europe, the Mediterranean, South-East Asia and the Pacific were directed by Supreme Allied Commanders; the defence of the Atlantic was directed by the Admiralty, under whose operational control Coastal Command was placed; the air defence of the United Kingdom was directed by Fighter Command. The primary reason for the appointment of the Supreme Commanders may have been political, the multiplicity of allies whose forces were engaged, but this central direction of strategy in each theatre simplified the co-ordination of operations of the complex forces.

The present-day view of the future is that this trend towards the closer combination of Arms and allies in the field will be continued, since the dominating question in the world is whether the antagonism between the Russian and Anglo-American groups of nations will lead to war. Such a war will be on a very large scale and the interim aims of both sides will be to seize, hold and supply those territories necessary to conduct operations or which are sources of vital raw materials, the Middle East oilfields being one example. The prospective long-range bombardment weapons do not alter this strategical conception. War may eventually be reduced to mutual bombardment by opposing sides of each other's homeland but projectiles of sufficient range and accuracy, against which there is no defence, are not yet within sight, and for the present the existing strategical form must remain the basis for planning.

This contention is not a deprecation of the power of bombardment weapons; on the contrary, it is the result of an appreciation that the threat of the destructive weapons already possible dominates strategy. A war of bombardment of the sort envisaged in the glib phrase, "press-button warfare," would be a war of attrition which we could not survive and on which it would be fatal to base strategy. The United Kingdom would be many times more vulnerable to such attack than any enemy visualized, and could not be defended by any system based on the English Channel and the North Sea. It would not be possible to evacuate the British Isles and the destruction of their industrial capacity would decimate the strength for war of the British Empire.

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Strategy must be based on exploiting the limitations of future weapons. The weapons of bombardment will probably be aircraft, unlimited in range but capable of interception, and rockets which cannot be intercepted but have comparatively short range. It will be necessary for defence to hold territory between the homeland and the enemy's operational bases, to deny him a base of operations within rocket range of our vulnerable homeland, and to establish air defence in depth to intercept his long-range aircraft outside our home territory. Our sources of raw materials and sea routes must be similarly protected.

Our forces in these outer defensive zones should be sufficiently dispersed and defensively emplaced to be unprofitable targets for bombardment weapons and enemy forces opposing them will be similarly dispersed in open formations under the threat of our bombardment, imposing tactical equality on the ground. The offensive constituents of our strategy will be waged with bombardment weapons on whose superiority to those of the enemy we shall depend.

Territory can be gained for use as a base or productive area only by land forces; bombardment can only sterilize it. The term "land forces" is used in the blanket sense of forces employed in a territorial campaign: they may consist of land, naval and air arms used in combination. The air will dominate the battlefield, but the ultimate aim of the operations is to place ground forces, and the organization to maintain all types of forces, in the objective area. Ground forces will be required because if our air arm can maintain air superiority the enemy will place greater emphasis on his ground forces in an effort to dislodge us, and although our air arm may break the main strength of his attack it must be supported by defensive positions on the ground to stop mobile units threatening our rear.

The above conception of war applied to the defence of the British Empire leads to the visualization of three types of operations: Theatre operations by forces of all arms in the contests for strategical areas; air defence; the defence of sea routes and strategic air bombardment. Unified operational control of each campaign and the appointment of Supreme Commanders, at least in theatre operations, can be expected since the same reasons will apply as in World War II, including the political one, since we shall, as in the past, belong to a coalition of Allies.

The object of this parenthetical discussion of the nature of future war is to provide a basis for considering how the Armed Forces should be organized to undertake the operations to which they may be committed.

It is visualized that various combinations of Arms will be required for different operations, but it is not possible to foresee how each of these combinations will be constituted, how the proportions of our resources will be divided between the various operations nor what the main threat will be. These factors depend on the weapons we develop, the enemy's strategy and the weapons on which he lays the greatest emphasis for any particular part of his strategy. It is necessary in war to take the initiative, but the enemy's actions cannot be disregarded and his main attacks must be countered even while an independent strategy is being developed against him. It is clear that the organization of the Armed Forces must be such that composite forces can be built up readily as required without radical adjustments of the internal organizations of the component Arms, and that it must permit any Arm to be strengthened when the situation requires by transferring personnel from those whose commitments fall below expectations. In sum, there must be flexibility in organization and strategical planning to react to a fluid strategical situation without impedance by rigidity of organization or having to compromise between divided councils.

World War II provides the only available data for examining the suitability of the military organization of three separate Services to meet these requirements. A few examples, however, of forces of different Services operating in combination provide evidence of inconsistency of the arbitrary division of weapons between land, sea and air, under separate Ministries each with its own organization of administration and maintenance.

The operations to command the sea employed ships and aircraft. The air forces employed varied according to the maritime situation. For example, when the German submarines adopted the tactics of crossing the Bay of Biscay surfaced, with long-range fighters patrolling the area to defend them against our bombers, we reacted by deploying long-range fighters and a complete air battle was fought out in the Bay until the enemy abandoned those tactics. When major German warships moved to bases from which they threatened our convoy routes, long-range bombers of Bomber Command were diverted from the air offensive to attack them, strategically reinforcing the maritime air forces. The bulk of the maritime air forces, particularly the long-range bombers engaged in anti-submarine warfare (including the flying boats which were long-range bombers of a particular type) were employed only on maritime operations because the campaign was sustained to the end of the war.

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The mercurial nature of the maritime strategic situation required their reinforcement from time to time, but it could also have released them if the enemy had withdrawn his submarines.

Command of the sea is a naval responsibility, which was the basis of the pre-war argument that Coastal Command should be incorporated in the Royal Navy, but it would have required a very large force to fulfil peak demands. The theory of a "fleet in being" lying idle in port is prodigality when applied to aircraft. The heavy bombers were not as successful against enemy warships in the first half of the war as they should have been, but that was because their equipment and weapons were inadequate for all bombing operations, the result of our unpreparedness for war. The heavy bomber became the pre-eminent striking weapon of the war in all operational spheres, and used as such when its versatility was recognized. A ship is not a target which requires a specialized bomber force: The combination of equipment and weapons which a bomber force uses to attack any small, strongly constructed target will sink any armoured ship.

Long-range bombers, suitably equipped, were an essential part of the combined naval and air forces employed on the maritime operations, but that did not irrevocably commit them to that employment. All long-range bombers, whether deployed in maritime or strategic bombing operations must be considered as being part of the total bomber force and available for redeployment as the whole strategical situation requires. Similarly, as land-based fighters were diverted to reinforce the maritime forces, the basically maritime carrier aircraft must be considered available to reinforce the strategic air forces when the air situation temporarily outweighs the maritime in importance.

It is inconsistent to allocate aircraft formally to maritime operations by dividing the Air Arm between two Services, with duplication of training, supply and operation procedure. The science of flying is related to the air and not to whether there is water or land beneath. There is no natural distinction between aircraft employed in maritime and strategical air operations. According to the function of their types they are transferable from one to the other, which is the guiding principle of the economical use of air forces.

The air defence of the United Kingdom was a complete campaign fought with fighter aircraft of the Royal Air Force and anti-aircraft guns of the Royal Regiment of Artillery. It would seem illogical that all the weapons of air defence, which was a Royal Air Force responsibility, should not have been established in the Royal Air Force as those of the air defence of Germany were in the Luftwaffe, and illogical duplication that two sets of dispatches should have been published independently on one set of operations. All anti-aircraft weapons, however, could not be incorporated in the Royal Air Force: the anti-aircraft gun is now accepted as a dual-purpose weapon because its high-velocity shell and accuracy automatically make it a good anti-tank gun. An army in the field must include anti-aircraft guns for defence against air attack and as these may also engage ground targets it would be inconsistent for them to be Royal Air Force units. Furthermore, an anti-aircraft gun is only a particular form of artillery and all the knowledge of artillery specialists and the organization of development and supply would be wastefully duplicated by establishing artillery in the Royal Air Force. The balance of the argument on these grounds weighs against anti-aircraft guns being Royal Air Force weapons and, in fact, conforms to the principle of economy of forces, that all weapons of an Arm should be centralized in one organization, in this case the Royal Artillery.

This list of examples of weapons of one Service applied to operations which are the sphere of another can be extended until practically every weapon can be shown to have this versatility. Shore-based artillery commanding a strait may play a part in maritime strategy by denying passage to enemy ships; a warship may support land operations taking place close to the coast by engaging ground targets.

A principle which can be extracted from these examples is this: The natural divisions between the Fighting Arms of the Services do not accord with their strategical or operational roles, but with the weapons or craft they operate. A ship is a ship and quite unlike an aircraft; a destroyer and a bomber operating together against submarines have nothing in common except their temporary operational role, but the destroyer is similar to all other ships and the bomber to all other aircraft. A fighter-bomber in a land battle may attack the same targets as a tank, but they have only the temporary operational function in common. The fighter's next sortie may be to escort a bomber formation. The sciences of seamanship, airmanship and land warfare are quite different branches of knowledge. Machines dominate modern warfare and the operation of the machines divides the science of warfare into its diversions. A Merchant Service officer who had no experience or knowledge of war would be far more competent to take command of a warship than an Army or Royal Air Force officer with no knowledge of seamanship, however deep the latter's knowledge of military strategy. A

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civil air pilot could fly a bomber or fighter into action after a short weapon training.

But in war the Arms engaged in these different sciences operate in combination as joint forces with common operational functions. There is a conflict between the tactical operation of the weapons of the different Arms and their strategic employment which is the combining of forces of various Arms and deploying them against the enemy in the most efficient way. There is no rule-of-thumb guide such as ship against ship, aircraft against aircraft, tank against tank. The essence of strategical direction is to select the best weapon or combination of weapons to engage each part of the enemy's forces, and to divide the available forces between commitments so that all are employed in the best manner against the keystones of the enemy's military structure.

The question arises, therefore, how joint forces are to be directed and commanded. Unity of direction is necessary in any warlike operation; a strategical policy may be formulated by a process of agreement between the conflicting ideas and contentions of allies and commanders, but when operations are put into motion the methods of conference and discussion must give place to the speed and decision of autocratic command. The principle of singleness of direction of combined forces is firmly accepted; the probability of supreme commanders in a future war, at least in some operational sphere, must also be accepted.

In World War II the selection of a supreme commander was made arbitrarily according to the nature of the operations—for those on land, such as the reoccupation of North-West Europe, an officer of the Army, for those expected to be predominantly maritime, as in South-East Asia, a Naval officer. This expedient cannot be accepted as a satisfactory principle since it does not necessarily provide a versatile commander for a combined force. The three Services tend to segregate in peacetime and fail to provide the wide experience desirable for a future supreme commander. The Supreme Commander in South-East Asia had, in fact, had the experience in wartime of being Director of Combined Operations; The Directorate of Combined Operations cannot be depended upon as the source of supreme commanders. It may be argued that a supreme commander can be adequately served by specialist advisers but the logical conclusion of this argument is that a supreme commander need not be a serving officer at all, but that an able civilian could direct a campaign with the advice of professional subordinates. This is untenable as a general principle and the reverse deduction must therefore be accepted that the director of a campaign will benefit by possessing wide knowledge of all the Arms under his command.

Professional knowledge is of two kinds. The first is the detailed specialist knowledge required to perform a particular task such as to fly an aircraft on a sortie or overhaul an engine. This may be called the part of "doing," and is the sort of knowledge required in the extreme by a junior officer or a man in the ranks. The second is the knowledge of what weapons, machines, men, units and formations are capable of, which is the province of the commander. This may be called the part of "knowing." The total professional knowledge of an officer consists of the sum of his knowledge of each kind, doing and knowing, and as he progresses in rank and experience the relative proportions change from a preponderance of doing to a preponderance of knowing. That of the former is gained by execution, that of the latter by observation. Knowledge of the former kind can be gained of only one or two of the many branches of the Armed Forces, but that of the latter depends on opportunity to observe and study. The segregation of the three Services sets up barriers to the acquisition of that catholicism of professional knowledge which is desirable for the direction of combined forces.

The Imperial Defence College and the Joint Staff College provide opportunity to study the broader principles of strategy. Of the latter it may be commented that its establishment is some twenty years overdue, following instead of anticipating World War II. Such institutions, however, provide only theoretical training which should be complemented by practical experience. The specialist's advice, upon which any commander of whatever degree depends, is best appreciated by a commander who is equipped with a foundation of knowledge of that subject. It may be added that the specialist is usually an enthusiast for his science or Arm and humanly liable to enlarge its merits and capabilities.

The foregoing argument on the direction of combined forces was developed from the premise that there is a conflict between the specialization of the sciences of operating weapons of the various Arms and the universality of their application to strategy. The same premise produces the twin argument on the constitution of combined forces for particular operations. A combined force consists of formations of all the Arms required, engaged in common or complementary operational functions and thereby fulfilling the whole strategical plan, but the Arms themselves are quite different in their organizations and modes of operation. The organization of the combined force as a whole must be such

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that it can contain these dissimilar elements, direct and maintain them, but retain that flexibility of control which is necessary for the economical use of forces. Every Arm and each unit of each Arm must be under such control of the supreme direction that it can be directed against any objective that the situation indicates. No forces must be "locked up" in some particular role. It must be possible to switch forces freely from objective to objective, and to assemble subdivisions of combined forces for a particular operation.

The division of the Armed Forces between three Services is unsatisfactory for operating combined forces in the field: It is too rigid for the free deployment of formations and does not conform to the natural division of forces between Arms. Each Arm is specialized and those divisions should be recognized but not to the extent that the three Services are divided in organization. The fact that in wartime the segregation of the Services is considerably reduced is evidence that it is an obstruction. The expedients such as "operational control" of a formation of one Service by another should not be necessary. The forces allocated to a particular campaign should be entirely directed by the responsible authority commanding, and that authority free to dispose them without regard to whether any particular unit is one of the Royal Navy, the Royal Air Force or the Army. The fact that in World War II there was this freedom in many spheres of operations supports the argument that the formal should conform to the factual.

At this stage administration and maintenance, as they affect the Armed Forces as a whole and combined forces in wartime, may be examined. Administration and maintenance must conform to the organization of the Armed Forces which gives them the greatest fighting efficiency, but if that organization also makes it possible for administration to be conducted most economically fighting efficiency will have gained since every man released from administrative work is an additional man for the fighting units or industry. It is a relevant factor that the number of men employed in administration and maintenance of mechanized forces is many times the number manning the fighting units.

Administration can be described as providing the men for the units and the necessities of life for the men. The administration of each Service is the same task therefore, since it concerns the common factor—men. Maintenance is supplying forces with all the material and equipment, repairing and replacing weapons, obtaining, storing and transporting them. These are the different branches of a maintenance organization: They are common to all three Services. Even in the technical sphere of overhauling and repairing machines the divisions are not marked by those between Arms or weapons but by the branches of mechanical engineering such as radio, instruments, machine-tool operation, welding, electrical engineering, internal-combustion turbines, steam engines, workshop management. Every major weapon of an Arm is a complex assembly of different sorts of mechanical devices and needs a corresponding number of different sorts of tradesmen to maintain it. Maintenance is industry taken to war with all its appendages of management, costing, storekeeping, transportation, packing. Overhauling a particular part of a weapon is a specialized job, but the basic training of a technician is in his trade. There is no fundamental difference between overhauling a tank engine and an aero engine, an aircraft radio and a ship's radio. Each is the application of basic knowledge to a job detailed by blue-prints or special instructions.

The administration and maintenance of the Armed Forces do not fall into natural divisions set by the different Arms, but into their own. The conflict between the specialized and universal characteristics of the fighting Arms arises again in the relation between operating their weapons and craft and administering and maintaining them.

The three Services are administered and maintained separately, which is convenient in peacetime when they lead separate existences, but in wartime when forces operate in combination, administrative and maintenance organizations are combined as far as possible to reduce duplication of supply systems—"Common-user" was a term of World War II—but extensive reorganization cannot be undertaken in wartime and there is much duplication. A combined force in the field cannot be administered centrally because each formation is dependent on its own Service. The size of headquarters staffs, particularly where the Services were combined in the field, was a feature of the last years of World War II which must arouse dissatisfaction. Administrative efficiency must be maintained, but the feeling cannot be avoided that some reduction could be made in the numbers of officers engaged in unproductive work by centralizing many of the functions of administration which are repeated by each Service, and that complete amalgamation of the Services would result in substantial economies in administration and maintenance.

The personnel branches of the three Services provide the first example to support the argument for unification. Advantages to be gained are the centralization of posting and record

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offices, enabling more use to be made of mechanical office equipment, and greater freedom in disposing trained men according to the fluctuating demands of the various Arms as the pressure of war shifts from one sphere of operations to another. Supply of equipment, at all stages, from placing orders with manufacturers to issuing items to front-line units, is equally clearly common to all Services; it is a specialized function which has no characteristic peculiar to one Service. When the three Services are operating together in a theatre of war, or garrisoning a colony in peacetime three supply organizations work side by side, each with its own office system and storage depots. Considerable pooling of resources, particularly transport, is necessary, and this has to be arranged as an expedient. A single supply service provisioning all Arms would have all the advantages of economy and flexibility.

Maintenance, which is fundamentally engineering, is a more controversial subject in the argument for unification. Superficially there is a wide gap between, for example, maintaining a ship and an aeroplane, but in fact it is not so wide. The divisions of maintenance follow more closely the divisions of engineering than of Services or Arms; each Arm employs many tradesmen common to other Arms. Unification of the maintenance services would enable training establishments to be centralized.

The main common advantage to be gained from unification of administrative and maintenance services is economy in manpower. This gain is not at the expense of the convenience of having "one's own show," a human desire, but a luxury which cannot be afforded in these straitened times and must be relinquished for the unpleasant impersonality of the big organization which is more economical. The big organization is often apparently less efficient than the small one, but the comparison must be made between the efficiency of the comprehensive organization and that of the sum of the several smaller ones which it replaces, and all industrial and business experience shows that a multiplicity of small organizations, though individually efficient, are not in the sum because there is repetition of work.

III

The argument which has been presented is that the Fighting Services should be amalgamated into one to remove faults of the present organization in the higher direction of strategical policy, the organization and command of combined forces in the field, administration and maintenance. Amalgamation is expected to remove these faults; the question to be answered is whether this amalgamation is possible. The subsidiary argument which arose is that the sciences of seamanship, airmanship and land warfare are specialized to a high degree, which conflicts with the universality of strategy, administration and supply; it may be carried to a conclusion that amalgamation of the three Services practising such diverse sciences is impossible.

The recapitulation is that the present compromise of inter-Service co-operation does not provide for strategical policy to be conceived as a whole, does not provide for combined forces of land, naval and air arms to be placed under single command and is wasteful in triplicating administrative and maintenance services. The coda is that amalgamation can be performed, that the conflict between specialization and universatility can be reconciled as easily as it is in each of the present Services, which contain many branches, and that the fighting efficiency of the Armed Forces considered as a whole and not as separate entities will be greatly increased, not hazarded, by amalgamation.

The argument has been developed entirely on a theoretical basis and no evidence has been produced on the practicability of such reorganization, even in part, which is the subject of this essay. The justification for the argument that total amalgamation is now necessary for the more economical and therefore efficient maintenance of our military strength will be the following suggested outline of an organization of a Combined Service and the method by which the change from the present three-Service organization can be made, thereby proposing as an answer to the question set for this essay: "Totally."

The overriding qualification for any reorganization of the Armed Forces is that no diminution of their fitness for war, however temporary, can be permitted while it is being made, whatever the ultimate improvement. Considerable reorganization of the Services, even within the present structure, could be profitably undertaken if it were possible to allow them to be uneffective for a period of several years, but the present state of international affairs and our commitments prohibit any reduction of effective strength. Any scheme for reorganization must take this factor into account and its rate of progress be correspondingly retarded to easy and progressive stages, at any one of which the process can be arrested without any loss of efficiency having been suffered.

This suggested recast of the organization is based on the following principles: The fitness of the Armed Forces for war is not to be impaired during reorganization; the new organization is

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based on functions and not on the division between land, naval and air forces; the specialized nature of seamanship, airmanship and land warfare, is fully observed; the traditions of established formations are preserved, except that names may be changed, for which there is ample precedent in Service history.

The three Services are not to be thrown into a huge melting pot and stirred until some near-homogeneous mixture is produced of mingled blue, navy and khaki hues, skinned of traditions and stewed into anonymity.

The plan for the amalgamated Service is to divide it into six main divisions—land, naval, air, technical, administrative and supply—under a single ministry, the Ministry for War (not "Defence" because the time has come for us "who speak the tongue that Shakespeare spake" to throw away euphemisms). The War Council is to consist of the Secretary of State for War (at present the Minister for Defence), the Chief of the Imperial Staff, Service and Civil members according to the departments into which the Ministry is organized.

These main divisions are to be subdivided be large and, in status, something between the present Services and a present-day regiment of the Army. They are to be functional. The three "fighting" branches will contain all fighting men, those who crew ships, aircraft, guns and tanks, and the infantry: The technical branch is to contain all tradesmen, technical officers, be responsible for all maintenance and technical development: The administrative branch is to be responsible for all administration, clerical work, manning, finance: the supply branch is to be responsible for the provision of all stores, equipments, contracts, buildings, land and transport.

These main divisions are to be sub-divided into many different branches: For example, the technical division, the most complex, will contain aircraft, ship construction, artillery, radio, civil engineering and many other branches, each splitting downwards into their specialized divisions like the roots of a tree.

The whole basis of the system is the method by which units are to be constructed which is similar to the present Army organization. A division or a corps or an army consists of units of many regiments and corps—infantry, R.A., R.E., R.A.O.C., R.A.S.C., R.E.M.E., R.A.M.C., etc. —built up into one complete body under a commander. The members of such a formation are drawn from many regiments, but once it is assembled cohesion is quickly gained and the formation acquires identity and, in battle, fame. Every man who served in the Eighth Army or the Fourteenth Army, whatever his regiment or function, was "Eighth Army" or "Fourteenth Army." This system is well proved.

In the amalgamated Service, an air squadron, for example, would consist of flying crews of the air branch, maintenance crews of the technical branch, clerical staff, medical staff of the administrative branch and storekeepers and a transport staff of the supply branch. Similarly, formations of any size or composition up to a complete theatre command could be assembled as required.

At this nomenclature may be suggested for the divisions of the Service. The amalgamated Service is fittingly named "His Majesty's Service"; the main divisions "Royal Services": the Royal Flying Service, the Royal Naval Service, the Royal Army Service, the Royal Administrative Service, the Royal Technical Service and the Royal Supply Service. Each of their subdivisions could bear the title of "Corps," the Royal Fighter Corps, the Royal Submarine Corps, the Royal Infantry Corps, the Royal Transport Corps, the Royal Corps of Civil Engineers, etc. The title "Royal" is by custom bestowed for diligence in the King's service, and this would be followed, particularly as new corps were formed to introduced new weapons.

This is the outline; some details are necessary to explain the working.

The Technical Service would be responsible for a great number of diverse and specialized subjects, ranging from ship construction, airfield construction, aircraft repair, experimental work in all branches, down to repairing kitchen stoves. It may be argued that the removal of the technical branches of the Fighting Arms from within their own organization would cause dislocation and the loss of that union between the operators and the technicians which is the essence of fighting efficiency in mechanized warfare. This would happen if measures were not taken to prevent it. The Technical Service is to be divided into corps specializing in the various branches of engineering and these corps must maintain close contact with the arms for which they provide maintenance services. That is a natural function of the management of any big organization. The object of concentrating the technical services is to remove responsibility for them from the Fighting Arms, whose responsibility is strategy and tactics, and enable the available resources of men, workshops and equipment to be distributed between the various operational formations according to the fluctuating demands of the strategic situation and the plans of the Ministry of War or the War Cabinet.

Training is a perpetual and heavy commitment in the Armed Forces which are always in a state

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of change due to the vigorous state of development of the technique of war, new weapons, expansion for threatening war or reorganization after war. The following outline policy is suggested.

Each Service would be responsible for that part of training concerned with its functions, for the training of its own personnel in their specialized duties and for maintaining its own training establishments. For example, flying training would be the responsibility of the Flying Service, technical training that of the Technical Service. Practically all training is composed of many subjects; tradesmen must be taught, in addition to their technical work, the use of arms, to man battle stations on a ship, ground handling of aircraft, administration and many other subjects of general Service knowledge, since every man, whatever his function, is a fighting man. Every Service training establishment would have on its instructional staff members of other Services to instruct in subjects not the function of that particular Service.

The Administrative Service would be responsible for the over-all control of training, statistical planning, drafting personnel for courses, recruit entries, selection of men and women, statistical and personal records.

It would be necessary to record meticulously the qualifications of every man in the amalgamated Service to ensure that men were qualified for the units to which they were posted. Although a member of H.M. Service, and therefore available for posting to any unit within it, a radar mechanic, for example, could not be haphazardly posted from a night-fighter squadron to a battleship; he would probably not be so universally trained, although it would be the policy in peacetime to qualify all Regulars as widely as possible. In wartime narrower specialization would be necessary.

Certain training establishments, particularly those concerned with the higher training of officers, such as staff colleges, would be maintained outside the individual Services. Basic recruits' training, which would be universal, would also be separate. These, it is suggested, would be called "Imperial" Schools or Colleges.

It was stated that heritage and traditions were not to be destroyed in the amalgamation. Amalgamation is to be performed by taking the elements of the existing structure and rearranging them, not by breaking it all down and rebuilding out of the rubble. Most existing formations would preserve their identity and new ones would, in addition, be created. For example, all the fighting regiments of the Army would be preserved unchanged; the Royal Air Force would become the Royal Flying Service, reaching back to touch the tradition of the R.F.C.; Fighter Command would become the Royal Fighter Corps. The Technical Branch of the R.A.F. would become one corps in the Technical Service, the Corps of Aeronautical Engineering, and parts of at least two others responsible for radio and armament. The R.A.S.C. would be the foundation of the Supply Service. The details of the reorganization could be similarly worked out to preserve most of the identities of the Services.

The process of amalgamation must be spread over a period of time; ten years is probably the shortest in which it can be fully achieved without dislocation. The first stage would be the setting up of a combined Administrative Service, centralizing all personnel administration; the second, the combined Supply Service; the third, the establishment of a Supreme Chief of the Imperial Staff and the War Council, which would assume by degrees the functions of the three Service Ministries; the fourth, the formation of the combined Technical Service; finally, the completion of the new organization.

Whatever the speed of the process of amalgamation, its full effects would not mature before the lapse of a further period of about fifteen years after its formal completion. The fighting efficiency of the Service would not suffer any weakness during this period if the change-over had been progressive; it would be a period of development as the characteristics of the old system were replaced by those of the new. The new system would produce a higher degree of specialization, particularly in the administrative and supply branches. They are large and complicated parts of modern warfare; they would be better directed by officers specializing and gifted in these functions than as at present by officers whose careers have been uncertainly divided between "General Staff," "A" and "Q" (to use the Army nomenclature). Amalgamation would remove objection to specialization, the restriction of careers, since in the larger organizations resulting more posts would exist in the higher ranks. If amalgamation is accepted as being ultimately necessary, it cannot be delayed. It will take the better part of a generation to achieve completely, when officers filling the highest posts have risen in the new organization with the training and experience it postulates. The old system has been patched and altered in the endeavour to modify it to present needs, but the future has always had insufficient attention. Co-operation, the present creed, must give place to combination, the demand of the future.

30th May, 1948.

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Prize Essay

By Wing Commander R. H. C. Burwell, D.F.C., R.A.F.

"If war cannot be abolished, the direction of our national resources and inventive genius to the needs of military air power would give us the greatest chance of victory."

THE problems which face those responsible for formulating our defence policy are more complex today than in any other period of our history. There are two main factors responsible for our difficulties, the first being the great shift that has taken place in world power, the second the development of strategic bombing.

Unpalatable though the thought is, there are now, in the material sense, only two great world powers, the United States of America and the U.S.S.R. Two world wars within a span of twenty-five years have left their mark on the British Commonwealth of Nations, and our general financial and economic position has deteriorated to a point where we are dependent on assistance from America. Both the United States and the Soviet Union, on the other hand, have such vast reserves of manpower and resources that, notwithstanding their war efforts, they have emerged as the dominant powers in international affairs. Unfortunately the ideologies which they represent are fundamentally opposed and the possibility that their differences will lead to war will continue to exist.

Our position in the new international situation is dictated by political and economic considerations which it is beyond the scope of this paper to discuss. From the military point of view, however, the implications are that we, together with the other Western European powers, are committed to align ourselves with the U.S.A. and therefore, by virtue of our geographical position, to bearing the brunt of the early stages of a future war. The development of strategic bombing and the devastating "blitzkrieg" type of attack which it has made possible serve to emphasize the danger to us of this new situation.

The possibility of the total destruction of a nation's resources which has arisen from the development of strategic bombing has been brought to culmination by the atomic bomb. By virtue of the concentrated nature of our industrial potential and our reliance on the vast quantity of food and raw materials which must pass through our ports, if life is to be sustained and defence continued, our vulnerability to this type of weapon is such that it is doubtful whether we could survive protracted air bombardment.

It is against this background that the "Statement Relating to Defence, 1948," which was published by His Majesty's Government this year must be viewed. It concludes that :

> "The supreme object of British policy must be to prevent war. In the situation where the United Nations Organization is not yet able to enforce peace, the best deterrent to war is tangible evidence of our intention and ability to withstand attack and to hit back immediately."

The limitations imposed on Defence expenditure by our economic plight will, however, affect adversely our ability to implement this policy with the absolute certainty of success. There is, moreover, always the possibility that Russia may underestimate Anglo-American reaction to a further attempt at political expansion and thus unintentionally bring about war. Our fundamental defence requirement is, therefore, for armed forces which, whilst providing a deterrent to aggression, will give us the best chance of victory should war break out. In deciding the best means of directing our national resources to achieve this aim the overriding consideration is the existence of "mass destruction weapons."

The Effects of the Atomic Bomb on our Military Requirements

The atomic bomb is the successful result of the co-operation of science, industry and government to produce a weapon of war, and the lesson it teaches is the extreme importance of research and development in the field of national security. However limited our resources may become by reason of our economic plight, it is essential that sufficient scientific effort should be applied to ensuring not only that we achieve adequate stocks of these weapons as soon as possible, but also that we remain ahead of our potential enemies in the development of improved and new types of atomic and other mass-destruction weapons.

The properties of the atom bomb are such that great destruction can be achieved cheaply both in terms of manpower and aircraft and industrial effort. The economy of effort which this has made possible means that plans and active preparations for a decisive strategic bombardment can now be carried out with a degree of surprise hitherto impossible to achieve. We have, as a result, lost the cushion of time at the beginning of hostilities which, in the past, has enabled us to mobilize our full resources and brace ourselves for the impact of total war. The discovery by our enemies of the secrets of producing atomic weapons and of the means of delivering them over long distances will, therefore, have an im-

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portant effect on our peacetime military requirements. Whereas hitherto the main task of our regular Forces was to provide a nucleus for wartime expansion behind light holding units, it is now necessary to have forces "in being" capable of providing instantaneous defence against air attacks, and ready to launch immediately a counter air offensive against vital enemy targets. The latter must include the air bases, rocket launching sites and industrial facilities essential to the enemy's air offensive.

Although at present science knows no effective defence against atomic weapons, as distinct from the aircraft which carry them, it is possible that means may be found to afford at least partial protection against these weapons. Our ability to survive atomic bombardment will, in fact, depend to a considerable degree on the success of research in this direction. But there is in any case a continuing requirement for defensive forces, both ground and air, capable of destroying the latest types of offensive aircraft. It is unlikely, however, that in the foreseeable future our air defences will be able to prevent the delivery in a comparatively short time of sufficient atom bombs or similar weapons to destroy our ability to wage war. Unless, therefore, we are able greatly to reduce the enemy's scale of bombardment by retaliatory measures we shall not long survive.

It follows that, in the absence of a warning period, the most important requirement of our national defence is for a strategic bomber force ready at a moment's notice to carry atomic explosives to those installations essential to the enemy's air offensive, and to his general war effort. The development of strategic air bases from which this force can reach the most distant of the enemy's vital targets is fundamental to a successful air offensive. In addition there is a need for long-range guided missiles to augment our bomber attacks. It is only by means of such offensive action that we can hope to reduce the weight of enemy attack against us in the early days of a "blitzkrieg" type of war; by this means alone can we hope to buy the time necessary to enable the full weight of Allied strength to be brought to bear and to allow us to seize the initiative necessary for final victory.

The ability to launch at any instant a long-range strategic air offensive has become, by virtue of the destructive power of the atom bomb, the most important single element of our military capabilities. This faculty alone, however, will not enable us to achieve victory, since our vulnerability to the new weapon demands considerably higher standards of defence than hitherto if we are to ensure that, in the face of surprise attack, we retain the capability to deliver our counter-offensive immediately. We shall therefore require, in addition to air defences, carefully balanced forces to defend our air bases from airborne and waterborne attack. In this respect military tactics are relatively unaffected by the advent of the atom bomb and the defence of these bases will be by conventional military operations, involving land and naval forces, characterized by increased speed of movement and heavier fire power. Naval and Army forces will also be required to reinforce or seize essential bases and to carry out specialized offensive operations with the object of reducing the enemy's capabilities to wage war.

Clearly the comprehensive nature of our military requirements is such that they cannot all be met from the limited resources available in peacetime for defence. In the present state of our national finances, therefore, it is more than ever essential that such money as is allotted to the Armed Forces is spent wisely and economically. A well-planned defence research and development programme will do much to offset our material shortcomings and will enable us to effect essential economy of effort in meeting our defence needs. It must be recognized, however, that in view of the existing international situation, in which it is impossible to envisage a global war other than between the U.S.A. and Western Union on the one hand and the U.S.S.R. and her satellites on the other, unilateral defence measures are inadequate and inevitably our military potential must be linked, in the long run, with that of our Allies. It is essential, therefore, that we should co-ordinate our military requirements, including scientific research, not only with the other members of the Western Union and British Commonwealth, but also with the U.S.A. Only in this way will it be possible to ensure that the Western Allies, by pooling their resources and accepting a common military doctrine, will be able to implement a co-ordinated defence policy which, if it fails to prevent war, will at least offer a reasonable chance of victory. The key to the success of such a policy, however, lies in acceptance of the overriding importance of strategic bombing as an instrument of defence and of the need, therefore, to direct our resources, particularly in the field of research and development, to the needs of military air power.

Objectives for Defence Research and Development

The overall object of our defence research and development must be to bring about the gradual evolution of our military capabilities in such a

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way that we obtain the advantages of the accelerated development of new weapons and methods whilst at the same time retaining the security afforded by the old. We must avoid the danger of being ready for neither conventional nor absolute war. Since, however, our resources in money and scientific manpower are limited we cannot afford to cover every sphere of defence and considerable importance attaches, therefore, to the priority to be given to our varied military requirements.

Apart from the overriding need for exhaustive investigation into mass-destruction warfare, including atomic, biological and chemical weapons and the means of protection against them, the most urgent commitment is for research and development to meet the needs of long-range strategic bombardment. Our requirement is for a subsonic high-altitude bomber capable of delivering weapons of mass destruction at distances in the order of 2,000-3,000 miles. Whether this aircraft will need to be armed will depend on the advances made in respect of problems of high-speed interception and anti-aircraft missiles. Since we are unlikely to be able to afford a large bomber force, bombing accuracy will be of equal importance with the performance of the aircraft; this requires extensive research into navigational methods and radar bombing techniques with the object of achieving true economy of force.

A further important factor in the development of the strategic bomber force is the provision of the necessary bases since the cost in money and material effort of constructing a "very heavy bomber airfield" is a serious drain on our resources. To meet our airfield requirements may well prove beyond our capabilities unless we can find means of overcoming the limitations imposed by the weight of heavy aircraft relative to concrete runway strengths. Research is, therefore, required to find a means of overcoming the take-off and landing problems connected with heavy long-range bombers, both from the point of view of landing gear design and permanent runway construction technique.

In the longer term a full examination is required into the potentialities of the pilotless aircraft and very long-range rocket. Such research, however, must not be allowed to prejudice the early provision of a strategic bomber force of the capabilities outlined above.

Of almost equal importance with the development of our offensive bomber potential is our requirement for improved methods of defence against air attack. This involves, in the first instance, research into the radar problems of the early warning system which, in the future, must be capable of detecting subsonic bombers operating at levels up to 60,000 feet and at ranges up to 200 miles. The system must be immune to radio counter-measures and must also incorporate automatic transmission to the anti-aircraft defences so that enemy aircraft penetrating the fighter screen can be effectively engaged by new types of ground-to-air weapons.

On the tactical side, development of the interceptor fighter is required to meet the situation where the margin of speed in hand over the bomber is insufficient to allow more than a fleeting engagement. This will affect not only the type of armament carried by the fighter, but also the methods of controlling aircraft interception; both of these aspects of fighter technique require extensive and continuous research.

Complementary to fighter defence, our ground defences must continue to form an integral part of the air defence system. The prospect of mass raids at high speeds and great heights calls for further examination of the potentialities of anti-aircraft artillery, particularly in the field of guided projectiles and proximity fuses. This must cover the problems associated with the tactical control of ground defences and must aim at achieving automatic fire distribution and target selection. The threat of atomic bombs requires that we should inflict a very high casualty rate among attacking aircraft.

Our ability to exercise air power is dependent on the capabilities of our strategic bomber force which, in turn, requires an adequate air defence system to ensure the security of the necessary bases. These two aspects of our military requirements are, therefore, almost equally important and a careful balance is required in the allocation to them of research and development effort. It is, however, also of great importance that we should direct an adequate proportion of our scientific effort and national resources to fulfilling the requirements of our naval and land forces.

Sea power is still vital to our very existence and the security of the sea communications between our main support areas and our strategic bases is fundamental to our ability to wage war. The main threats to these communications are from submarines, mines and aircraft attack.

The development of high-speed submarines capable of remaining submerged for long periods constitutes a serious menace to our shipping and there is, therefore, an urgent requirement for the development of new methods of underwater detection and more effective anti-submarine weapons, including those suitable for use by maritime air forces.

The problems of mine warfare have become more complex as a result of the development of selective fuses and further research is, therefore, required into both its offensive and defensive

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aspects. In particular, the development of counter-measures to non-contact mines, including means of locating and neutralizing them, is of paramount importance.

The threat of air attack against our sea communications includes the possibility of atomic bombing which will, however, probably be confined to terminal ports. The vulnerability of our shipping will increase as the range and bombing accuracy of land-based aircraft increase. The development of our naval strength must, therefore, include elements of maritime air forces capable of achieving air superiority in the area in which our forces are required to operate. The culminating development of seaborne air power will be the ability to concentrate air forces within striking distance of enemy objectives which are outside the range of land-based aircraft. This flexible combination of air and sea power will considerably reinforce the deterrent effect of the strategic bomber force and, in the event of war, may play a decisive part in our counter air offensive. Much research is required, however, in this field, particularly in respect of the need for long-range aircraft capable of "flying-off" at heavy loads, and of the anti-aircraft and anti-submarine defences required by large carrier-task forces.

In the initial stages of a future war the primary role of our land forces will be to ensure the security of our essential air bases in the face of airborne and seaborne threats. In view of the extensive demands on our resources to meet the needs of powerful air and naval forces "in being," it will not be possible to maintain large land forces in peacetime and it will be necessary to find alternative and more economical means of fulfilling the traditional peacetime commitments of the Army in respect of the garrisoning of overseas bases.

The initial requirement for our land forces in war will be for highly mobile air-transportable units armed with up-to-date weapons of maximum firepower; considerable research is needed, therefore, into the problems of integrating the designs of new light-weight Army equipment with those of future military air transport aircraft.

The successful development of our strategic air offensive and the resultant diminution in the threats to our bases will, however, necessitate the rapid expansion of our land forces to make possible the capture and occupation of territory essential to our further offensive action. Supporting tactical air forces will be required, and it is necessary, therefore, that the technique of the ground attack fighter should not only be kept alive, but also that research and development effort should be directed towards producing the best aircraft and weapons for the task.

The above paragraphs give only the broadest outline of the many fields into which our resources and inventive genius must be directed if we are to meet the requirements of an age in which air power is the key to victory, and strategic bombardment has become the predominant factor in defence.

The development of the atomic bomb and other mass-destruction weapons has, however, in no way reduced the need for balanced military forces. It has, on the other hand, made national defence more difficult, more expensive and less certain of attainment. Although the direction of our national resources to the needs of military air power will give us the best chance of victory, never has the need to prevent war been so vital.

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Some Aspects and Lessons of Air Warfare, 1939-45

LECTURE BY AIR MARSHAL SIR T. W. ELMHIRST, K.B.E., C.B., A.F.C.

THE points that I hope to make in this lecture invite argument and I sincerely hope that I shall be cross-examined on some of them in the discussion that follows.

You will say what are my credentials in that I lay claim to talk at all on this subject? My answer is that few officers in any Service had such a seat in the front row of the stalls from which to watch many of the major events of the last war.

I started the war by despatching the first R.A.F. bomber squadron to raid Germany on the first night of the war. I was head of the German Air Intelligence Section at the Air Ministry from January to August, 1940. During this time I was able to hear from escaped Norwegians, Dutchmen, Belgians and Poles how the German was conducting his early campaigns. I was also at this time a member of the Cabinet Sub-Committee on the invasion of England, so I knew what we were up against, both in the air and on the ground. During the height of the Battle of Britain, and till its close, I was one of the three Air Commodores who split the twenty-four hours as the executive officers on duty in the Fighter Command operations room. In 1941 I was at R.A.F. H.Q. in Cairo, living as a "P.G." with Air Marshal Tedder. Throughout 1942 I was with the Desert Air Force and 8th Army and was a member of General Ritchie's and General Montgomery's mess. In 1943 I transferred to Algeria with the 18th Army Group and 1st Tactical Air Force and saw the completion of the African campaign and the invasion of Sicily and Italy from General Alexander's mess tent in Tunisia and Sicily. In 1944 I was in London with H.Q. 21st Army Group, planning for the invasion of Europe and shaping the 2nd Tactical Air Force for its entry into Normandy. I accompanied, as A.O.A., the H.Q. of this latter Force with H.Q., 21st Army Group, through France, Belgium and Holland, till we finished up together in Hanover.

The science of flying is still in its infancy, likewise the methods of conducting warfare in the air. Armies and navies have moved about the surface of the earth for thousands of years and though the weapons of such forces have improved, and their mobility has been stepped up, the science of their warfare has changed little. For example, a student of the military arts can still gain knowledge from reading the campaigns of Alexander, Caesar or Napoleon.

The air weapon, however, was first used in war in 1914, only thirty-odd years ago. Its influence in the 1914-18 war was very small. It gave navies and armies some reconnaissance that they were otherwise unable to get. But the air forces of the Allies and Germans fought out a battle above the heads of the armies in the trenches, and the result of the war, the gaining of victory, was hardly influenced at all by these fights. Victory was won by a combination of the successful blockade of Germany by naval forces and by the Allied armies as a result of four years' hard fighting, in the main, in France and Flanders, resultant in the case of the American and British armies of being landed on the Continent by the Navy.

Now I propose in this talk to try and show the enormous differences in the methods of conducting warfare as a whole brought about by the advent of the flying machine, of the improved standard and with the vast numbers that were available and employed in the 1939-45 war.

I have said that I consider the air weapon had a negligible influence in the result of the 1914-18 war. I suggest, and I hope to show, that the victory in the 1939-45 war was influenced to a very great extent, say over 50 per cent., due to the advent of the aeroplane.

The effect of aircraft in any future war—and the advance of the science of aeronautics is still rapidly continuing—is something I shall leave to your thoughts!

In my review of certain aspects of the air warfare in the 1939-45 war I propose to start off with mentioning some results of the German and Japanese air offensives in the first months of their campaigns when they had the ascendancy, more or less complete, over the air forces of their enemies.

In Poland superiority in the air, after the first day, enabled the German dive bomber to strike terror into any formed body of troops in that country. The German ground forces moved where and when they wanted. The Polish forces were soon in disorder, all their rear communications blasted, control gone, and movement by rail or road only possible at night. The campaign was over in a month!

In the invasion of Norway complete local air

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superiority enabled airborne forces to be put into key points in Southern Norway on the first day. Likewise, this local air superiority prevented the Royal Navy from impeding the transport by sea of German forces crossing to Southern Norway from Germany and Denmark.

Complete air superiority and lack of opposing A.A. artillery in the opening stages of the German advance into Holland and North Belgium enabled airborne forces to be put down at the outset into The Hague and across Belgian canals, where for forty-eight hours they caused the utmost confusion before they were joined by the following-up land forces who consolidated the positions won.

The devastation by bombing of a section of Rotterdam ensured a quick armistice with the Dutch and the same threat held over Copenhagen, Brussels and Paris undoubtedly brought about quick armistices with those countries who by then had little, if any, aircraft or A.A. weapons to defend themselves with.

There will be many who will remember the effect of almost unimpeded dive bombers on the British troops during their retreat to Dunkirk.

One other example of German local air superiority. After the Battle of Britain, German air forces in some strength were despatched to Sicily and the Balkans. Once they were firmly established in Sicily, in Greece and Crete they closed the through Mediterranean passage to Egypt except to submarines, causing the Cape route to be used by all shipping supplying the Middle East base. The amount of shipping then required was doubled and the length of passage trebled. This local command by air forces of the Central Mediterranean area was held by the Germans for nearly two years. It was very gallantly disputed by the Royal Navy and Merchant Marine and the R.A.F. in Malta, in their efforts to supply that blockaded island. They got the occasional supply ship in at very heavy cost. But the Malta siege was not raised until the 8th Army finally secured air bases in Cyrenaica, which allowed the R.A.F. to get back air superiority in the Eastern Mediterranean and escort convoys from Egypt to Malta. The through Mediterranean passage was only opened when air bases in Tunisia had been captured for the Allied Air Forces by the Allied troops advancing from Algeria.

Turning to the Japanese entry into the war. Within a few weeks they had air superiority in and around the Malay Peninsula, with the result that a tiny force of forty torpedo bombers could sink the *Prince of Wales* and *Repulse* with the consequent complete loss by us of control of sea communications in that area and accordingly the loss of all we possessed in the South-West Pacific.

Now let us turn over the page and consider the effect of the most vital single battle for air superiority that the war saw, and what were its results.

In July, 1940, on the continental shores of the North Sea from Northern Norway to Brest was a ring of German air bases for the launching of the air attack on Britain. German superiority in the air had closed the southern North Sea, the mouth of the Thames and the English Channel to our shipping—naval or merchant. The German plan was to defeat the R.A.F. and thereafter to let their aircraft range where they liked *by day* over Great Britain, destroying any key-points they so wished. Once the R.A.F. were defeated, for which they allowed four days, the invasion was to be launched in the Channel under the cover of their own air umbrella, which was to keep off the British Navy. And they had already had the experience on the coast of Norway that with local air superiority they could move their transports at will.

The Battle of Britain was won, with the consequence that England was not invaded and became a firm base for four years in which armed forces could be built up at leisure, for striking at the heart of Germany, for the return to the Continent, and for the supply of our overseas forces. Air superiority fought for and won allowed the Channel and Thames to be re-opened to our shipping.

A word now about the Allied Tactical Air Forces in the field working with Allied armies in Africa and Europe. The role of any air force working with an army is first to ensure freedom of movement to its army and deny it to the opposing army. Thereafter to put the whole of available striking power on to ground targets, the destruction of which will assist the advance of the military forces. The only way of ensuring the freedom of movement is by knocking out the opposing enemy air force either in the air or on the ground and keeping it knocked out.

The R.A.F. gave this freedom to the desert armies in the first Libyan campaign, but through lack of aircraft failed to give it in Greece and Crete, with the consequent disaster to British land and naval forces.

The naval losses by German bombing alone in their gallant and magnificently successful efforts to evacuate British forces from Greece and Crete in the face of complete German air superiority are striking. The price paid was 3 cruisers and 6 destroyers sunk, 1 battleship, 1 aircraft carrier, 3 cruisers and 1 destroyer seriously damaged, and 1 battleship, 4 cruisers and 6 destroyers in need of extensive repairs. Our

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Navy, in the successful evacuation of approximately 50,000 troops, had suffered the heaviest defeat it had had since the Dutch wars of the 17th century. The defeat was entirely due to local German air superiority, for the Italian fleet had been completely defeated a month before at Matapan by Admiral Cunningham.

In late 1941 and early 1942 in the desert there was a very close fight for air superiority. It was won by the R.A.F., with the result that there was not an Army casualty by day due to air attack in the long retreat from Gazala to El Alamein. This superiority was never again lost in the Western Desert. It enabled the enormous build-up of the 8th Army to be made in peace behind the El Alamein line, and it forbade any build-up by Rommel, whose supply lines were continuously cut by air forces and submarines (based in Malta and Egypt), all the way back to Italy, until eventually his supplies ran dry and he had to make the best of a long retreat, leaving thousands of vehicles and many aircraft behind because their petrol tanks were empty.

In the early days in Tunisia the Germans had local air superiority and the Allied armies were getting nowhere. Armies were far ahead of their air bases and suffered badly from German air attack. Eventually air bases were pushed forward, air superiority won, and the Allied Air Force control extended all over Tunisia with bombers and their escorting fighters ranging at will. All exit and entry to Tunis and Bizerta was blocked by air forces and naval submarines, the German communications were destroyed, and when the final push from the 1st and 8th and U.S. armies came the Germans collapsed and 300,000 prisoners fell into our hands for a very small casualty list on the Allied side.

I can still see the rear areas behind the British and American lines the week before the final attack on Tunis. Perfect weather and the roads packed bumper to bumper with supply vehicles. In addition, a whole corps moving round by day in lorries from the 8th Army front to the 1st Army front. There was no camouflage or spacing of vehicles in convoy required. It was the same on the long retreat to El Alamein. But on the other side of the line in Tunisia not one vehicle moved by day without bringing on itself an attack from the air.

I will now turn to another aspect of war—freedom of movement on the ocean. The British Empire was again in 1942-43, as in 1917, nearly defeated by having its Atlantic and other communications cut by German submarines. This campaign was countered and eventually defeated by the combined efforts of naval convoy escort vessels and air forces. The final defeat came when long-range British and American Air Forces based in Iceland, Greenland, the British Isles, Newfoundland, Bermuda and the Azores could cover every spot in the North Atlantic.

Aircraft radar appliances could find the enemy on or under the water. The submarine got no peace night or day, suffered heavy casualties both from surface craft and aircraft, and gave up the unequal contest. German Admirals have said since the war that the main cause of the defeat of their submarine campaign was the long-range bomber-reconnaissance aircraft with its radar devices.

Regarding the final stages of the war, the assault on Europe, I will say a few words on the part the Strategic Air Forces played. I will not again mention the Tactical Air Forces, when they were based in Europe, except to say that they did as they had done in the latter stages of the African campaign. They gave complete freedom of movement to their own ground forces and completely denied it to the enemy land forces by road or rail, except at night (luckily for us the nights in Northern Europe are very short in summer), and in bad weather such as the first four days of the Ardennes offensive.

The Strategic Air Forces of the R.A.F. Bomber Command and American 8th and 15th Air Forces, based in England and Italy for the last two years of the war were no mean force. They ran into millions of men. What was their effect on the war?

They had first to fight for superiority over Germany and its satellite countries before they could range at will over the country and pick out their targets and utterly destroy them. The R.A.F. Bomber Command had been fighting it out by night for four years over Germany. For four years they had been the only force to hit Germans in Germany. They were, further, the only force that by sea-mining could and did impede the vital German iron ore import trade in the Baltic. By their bombing they had caused the German Air Force to switch over aircraft production from bombers to night fighters. The German Air Force was thus forced on to the defensive and German bombers ceased to worry the main Allied bases in England and the Middle East. The air battles took place over Germany instead.

R.A.F. bombers had gradually advanced bombing technique until they could hit an unseen target, and they had also caused a million Germans to be employed on active and passive air defence within the Reich. In 1943 the big American day bombers came along and, in 1944, that weapon which changed the aspect of the war, the long-range escort fighter. This American day-bombing force, with its escort fighters, had

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to fight for air superiority *by day* over Germany. They won it.

Once the air superiority was won, both U.S. day bombers and R.A.F. night bombers based in England and Italy set about destroying the German petrol supplies. The campaign started in February, 1944, and was completed in September, 1944. In six months the factories producing fuel to the amount of 700,000 tons a month in February were all destroyed and the passage up the Danube of oil from Rumania was blocked by airborne mines. The Germans, except for a few little reserves, were out of fuel and their armed forces, both ground and air, nearly immobilized. The German rail communications were then set upon and they likewise were impeded and broken in France, Belgium, Germany, Austria, Italy and the Balkans, so that little movement was possible and that mainly by night.

As the Allied ground forces advanced through France and Italy so air bases were made closer to German soil and so more fighter escorts could be provided for deep bomber penetration into German territory until finally there was no place under German occupation that bombers could not find, attack and damage.

Another word on the use of bomber forces. They are the most flexible weapon of war yet produced. On one day, and often from the same base, they can destroy invasion barges, the next day sink a *Tirpitz*, the next cause the submission of a fortress, Pantellaria or Rouen. Again, they can put 7,000 tons of bombs as a carpet in an hour before advancing troops—Caen. The following week they can reduce Hamburg docks to ruins or destroy the enormous Leuna petrol refinery.

To turn to the invasion. What was the problem involved? The simple one: in a space of time could we put more forces on a stretch of beach than the Germans could bring up to push them back into the sea? The Allied Air Forces were, therefore, given two functions, first, in conjunction with Allied navies to ensure freedom of our own troops' movements to the beaches and, secondly, to deny the enemy's free movement by land to the beaches. To ensure this latter function, within one month Allied Air Forces destroyed every road and rail bridge over the Seine and Loire between Paris and the sea. They likewise destroyed all rail centres in Western Europe that might be employed by the Germans. Some German divisions came from Paris to Normandy on bicycles, such was the disruption of communications.

General Rundstedt made the following remarks when interrogated by British military officers on the conclusion of the war. "The main difficulties which arose for us at the time of the invasion were the systematic preparations by your Air Force, the smashing of the main lines of communication, particularly the railway junctions. We had prepared for various eventualities that all came to nothing or were rendered impossible by the destruction of railway communications, railway stations, etc. The second thing was the attack on roads, on marching columns, etc., so that it was impossible to move anyone at all by day, whether a column or an individual—that is to say, to carry fuel or ammunition. That also means that the bringing up of the armoured divisions was also out of the question—quite impossible. And the third thing was this carpet bombing. . . . These were the main things that caused the general collapse."

General Omar Bradley has said that he took nearly a million prisoners on his advance from Paris to the Siegfried Line at little cost to his Army, because the Germans had neither rail nor petrol for road transport with which to get away.

Let us turn for a moment to the final defeat of Japan. Nowhere was Tedder's 1941 dictum, "This war is a war for airfields," so clearly proved true. The whole United States strategy had the object of, step by step, constructing landing-grounds across the Pacific until the main islands of Japan were in range of shore-based bomber aircraft and their escorting fighters. Their naval and ground forces were used to capture these Pacific Island landing-ground bases, using carrier-borne aircraft to get freedom of movement. Once, however, the Okinawa and Iwojima final landing-grounds south of Japan had been captured and brought into use the end was near. A complete blockade of the Japanese mainland was established, by submarine and by air forces, and the Japanese air force was knocked out of the air or destroyed on the ground. The U.S. Air Forces ranged at will over the country, sinking ships in harbour, destroying fuel supplies, factories and communications, with the result that Japan was left with the personnel of her armed forces but little material, food, or communications with which to continue the war. The atom bomb, when it came, merely showed the further absurdity of any effort by Japan to continue the war.

Before attempting to sum up these aspects of the recent air warfare, I should like to say a few words on Airborne Forces, their use and abuse in the last war, and their use in the future. It is a controversial subject and naturally of much interest to soldiers and also, of course, to airmen; so I shall go into it in a little more detail than the subject of this lecture really warrants.

My experience of the work of airborne forces in the last war is general and not detailed. But

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in 1940, in my Intelligence capacity, I had to interview escaped Poles, Norwegians and Dutchmen who had watched and attempted to deal with German airborne troops. In Cairo in 1941 I was able personally to discuss with the senior R.A.F. officer, Crete, his report on the capture of Crete by airborne forces. I have likewise read the detailed German report of these operations. I was at G.H.Q. in Tunis when airborne forces were despatched to Sicily, and at G.H.Q. in the field when they were used in Normandy and at Arnhem, and for the final crossing of the Rhine.

With regard to their employment, there is one first principle and prerequisite. That is that air superiority must have been fought for and obtained, to nearly 100 per cent., before airborne forces can be launched.

Military commanders, of probably the most highly trained fighting soldiers, are not wishful that this first-class material be destroyed in slow unarmoured aircraft before the soldiers put foot on the ground to fulfil their sole purpose, that of fighting troops on the ground.

A second principle regarding their employment is that their supply of ammunition and food shall be sufficient to enable them to fight until supplies by normal means can reach them. They can take little with them on a surprise drop and once they are on the ground in enemy territory they must expect to be surrounded by armoured forces and artillery. Any further supply by air then becomes a suicidal policy. Even if there is complete air superiority, unarmed and unarmoured aircraft flying in low, even by night, to drop supplies on a surrounded force are "cold meat" to an enemy supplied with mobile A.A. artillery. Goering stated that the attempt to resupply and evacuate by air the surrounded forces at Stalingrad and Tunis was the death-knell of the German bomber force, whose aircrew were used and destroyed for that purpose.

All last war experience showed that parachutists' lives were thrown away if their supply by normal land or sea forces was not functioning within two or three days.

If there is *no* opposition, either from air bases or A.A. guns to the dropping of airborne troops, then it is hardly a "war operation" but a normal "Movement by air."

Another point that should be realized is that for a night drop in war to be a success, the most war-experienced and best-trained bomber crews must be used to man the transport aircraft. There is no more difficult and hazardous job than the piloting of relatively slow heavily loaded aircraft, possibly towing a glider, across water, making a landfall on a hostile and unrecognizable coast at night and then navigate to an exact spot close to the ground under heavy A.A. fire.

Another aspect that must not be forgotten is the overall strategic plan of a war. Can a country afford to lock up, say, a thousand heavy aircraft and their trained crews for a *possible* parachute operation when that material might otherwise be used for furthering the main bomber campaign in hitting the enemy's vitals a thousand miles within his frontiers? Likewise, can the Army afford to lock up for a *possible* operation a quantity of its most highly trained troops?

If I may give my own personal opinion on the subject of airborne forces, I would say that no modern army should be without this weapon in its armoury. But that the number of troops so trained should be limited, having in view the possible occasions for their use, and the relative value of the aircraft and crews earmarked for training and carrying such troops.

It should be remembered that in peacetime and the early stages of a future war, material available to armed forces is limited, and a large front-line strength of troop-carrying aircraft of necessity means a smaller bomber striking force. I would say, of course, that all troops should be trained in moving by air. The need for increased mobility of all forces is surely one of the lessons of the last war.

A last word on this subject. Do not let us forget that the very fruitful air supply organization developed in the Burma campaign could not have so functioned if the air battle had not been previously won and unless the Japanese had not been woefully deficient in A.A. artillery. Can we hope for such a state of affairs in the early days of a future war?

Now for conclusions and lessons. If any country goes to war its object is to impose its will on the enemy in the speediest possible time and at the most economical cost. The object of a war must thus affect its conduct.

Before the advent of the air weapon the British method of waging a war was by the combined use of sea power and land armies. Sea power allowed us to transport our armies overseas where and when we liked. Our armies, after defeating the armies of our enemies in the field, marched to the capital of the enemy country and there imposed our will on the enemy.

In this last war, for the first time, the aeroplane made its appearance in strength and, I suggest, showed that the age-old normal methods of conducting warfare are completely outdated.

Here is a new infant force which travels in a previously unused element, the air, and we must give thought to new methods of conducting war that are most economical both in time and

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material. One shudders to think of what would be left of industry and communications in India or England if in a future war we lost air superiority.

I suggest that if we had not had a competent fighter force in 1940, Britain would have been occupied that summer and we should have lost the war that year. If their base is in ruins, and no supplies forthcoming, armed forces cannot continue to function.

The air weapon saved us from defeat in 1940. It did not give us victory, but it gave us time to build up armed forces of the three arms that, with the help of our Allies, were to give us victory later.

We needed and shall always need sea power to ensure that our firm base in Britain is supplied and fed and that our land forces and their supplies, and supplies for air forces, can be shipped around the world to bases where they can best be used to impose our will on our enemy. The capturing and occupying of such bases is a matter for soldiers borne thence in ships; likewise, the occupying of the enemy country for the final imposition of our will is a task for soldiers. The ensuring that forces on land or sea can move at will is one of the tasks for air forces.

But for the imposing of a will on an enemy at the beginning and throughout a war there is now a new weapon in a bomber striking force that, once air superiority has been gained, can go across sea frontiers and, if it is in sufficient strength and has the range, can get at the *heart* of an enemy country, while ground and sea forces are still only touching the extremities of the limbs of that country.

The attacks of the strategic air forces on Germany in 1944 and 1945 sucked the German egg dry and the empty egg-shell left at the end of 1944 only needed a concerted pressure from all sides for it to crack. And there were very few casualties (as compared with the Somme battles of 1916) to the Allied ground forces when exerting the final squeeze. The casualties of the British Army between Normandy and the Baltic were approximately the same as those of Bomber Command throughout the war. These were not light, but nothing compared to the million dead left in France in 1914-18.

On 15th March, 1945, Speer (Hitler's Armament Chief) reported to Hitler that (due to the destruction of fuel and transportation by bombing) "the final collapse of German economy can therefore be counted upon certainly within four to eight weeks. . . . After this collapse even military continuation of the war will become impossible." Our ground forces were not then across the Rhine.

In Japan there was the same situation a few months later, and there no invasion was even necessary to enforce our will.

But this air striking power could not have been brought to bear on either Germany or Japan unless bases had been secured at a convenient distance from the enemy's heart from which to exert the pressure. These bases, whether in France, Italy or the Pacific, were captured, secured and supplied (and in this latter case the English base as well) by sea power and soldiers, once freedom of movement by land and sea forces had been assured by air battles.

As I have said, the air weapon is still in infancy, and the type of missile it can carry has lately become 100 per cent. more destructive, and who can say what will be the pattern of future wars? But with our present experience of wars and looking ahead as far as we can see, all three arms of the Fighting Services are a requisite for victory in war. It is the decision on the relative strength of each of the three arms where the greatest wisdom is required.

Finally, I would give it as my firm opinion that Germany lost the war because the balance of their three armed forces was wrong. They stinted their air force as compared with their army in 1942 and 1943, and, as a result, lost the air battle over Germany and so uncovered the heart of the country, which air forces destroyed, thus rendering their magnificent fighting troops deficient of resources and mobility to stop the final invasion of their country and the imposing of the Allied will upon it.

In peace-time, in democratic countries, the amount of a country's revenue that can be devoted to its armed forces is small. It is then up to all of us, who have a say in the matter, to ensure that the armed forces we have in peace-time are *properly balanced*, equipped with the latest devices science has produced, and highly trained. Only by so doing can we counter the first shock of an aggressor and immediately hit back at his heart. We are unlikely to be given four years, as we were given in the last two wars, wherein to build up our resources.

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A Lecture on Some Aspects of Administration and Staff Work

By Air Marshal Sir Thomas W. Elmhirst, K.B.E., C.B., A.F.C.

THE points I am going to make in this talk on Administration and Staff Work are all points that have stuck in my mind as a result of my personal administrative experience in the last four and a half years of the 1939-45 War. For the concluding three and a half years of that war I was head of Administration (the equivalent of M.G.A.) of the British Air Forces in the field, in the Western Desert, Algeria and Tunisia, Sicily, and in North-West Europe from the invasion to the end of the war. During the period my Headquarters was set up alongside 8th Army H.Q. for a year in the Desert, 18th Army Group for eight months in Algeria, Tunisia and Sicily, and alongside 21st Army Group at St. Paul's, in London, and on the Continent, and my opposite numbers as heads of the Army Administrative Staff were Generals Charles Miller, Brian Robertson and Miles Graham, and I learnt a lot from them all. My other wartime administrative work was in 1941, the starting from scratch (myself, a clerk and driver) of the R.A.F. H.Q. in Egypt. My "charter" was to form an H.Q. and take over forthwith the Fighter Defence of Egypt, also every R.A.F. unit and base installation between the Desert on the west and Palestine on the east. Some 80,000 men in all, and I was told by my Chief, Lord Tedder, that there were no trained Staff Officers available for my H.Q. but I must train them myself! We had a reasonably smooth working H.Q., of some fifty officers, within six months.

So the points I make have some hard experience behind them, covering retreats, a part in the planning of two opposed landings and the odd victory!

What is *good* administration? If I might suggest a definition: "The smooth functioning, under one head, and with the smallest possible number of staff, of any organization." An "organization" may be a house or home, a factory, a Government department, an infantry company, a flight of aircraft, or an army.

May I quote a remark made to me by the Chief (Sir Arthur Cunningham) I served under for three and a half years in the field? "I went into so-and-so's caravan this morning. It was 'untidy.' If his own private domain is untidy he has an untidy mind and any Staff department or unit he commands will be untidy. He obviously cannot organize his own life—how then can he organize a fighting unit?"

If I may then repeat myself—good administration is a "tidy" organization running smoothly and economically.

In a fighting force how then can we obtain such a satisfactory state of affairs? I would say that the first essential is that each unit in the force must have a useful function to carry out in part fulfilment of the purpose of the force as a whole.

The purpose of the unit or its "policy" should be shown on its "establishment" and that "establishment" should be drawn up with just sufficient officers and men in the right ranks with sufficient vehicles (and/or materials) to meet the "policy." No more, no less. If it has less or more it is "untidy" and uneconomical and will not function smoothly. I cannot stress too much the need of good establishments. A knowledge of how and why they are drawn up, by all officers, both unit and staff, is a necessary background to all administrative work.

And another word on establishments. They should never be looked upon as unalterable. I know in the Royal Air Force, between the wars, it needed almost an earthquake to enable a unit's establishment to be increased by one fitter or cook, or decreased by one specialist man (whose job had ceased because the unit was using a different kind of aircraft or armament). In fact, an Air Ministry Committee had to sit in London to alter the establishment by one man of a unit in Singapore!

In war such a state of affairs became quite impossible. New units for specialist jobs have to be formed or old units re-formed to meet the tactical needs in new circumstances in overseas theatres of war. Accordingly, decentralization of power to make and alter establishments was given by the Air Ministry to all Air Commanders-in-Chief in the field.

For example, I can remember in Algeria, in the first setting up of the Combined H.Q. of 18th Army Group and the 1st Tactical Air Force, that we found many units as they had disembarked from England were either unnecessary or required complete re-formation to meet local needs. Again, other types of units and H.Q. had to be formed. In one week I drew up ten new establishments, had them agreed and issued;

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officers posted to fill the vacancies, and by the last day of the week the new units beginning to take shape.

The ability to alter establishments quickly to meet tactical needs is vital in war.

The American forces had the same difficulties at the beginning of the war. I remember a unit of theirs of a thousand men sent to North Africa from across the Atlantic for a certain job, but on arrival the tactical air situation made the job unnecessary. But the unit sat idle for two months until Washington agreed that it could be disestablished and the men made use of otherwise.

We were in the same position at the beginning of the war and learnt our lesson—so did our U.S. friends. Don't let us forget it when another war comes.

The next stage in a tidy organization is to see that units are "brigaded" together under the control of a superior formation. Such a process is usually known as the drawing up of the "Order of Battle" or chain of command, or family tree. For any unit or force to function smoothly every man, or unit, or formation concerned, must know who his superior officer is, *i.e.*, he must know the chain of command. As regards the number of units to be under one higher formation or the number of heads of departments to be under one superior staff officer, the supposed golden number is four. The number is variable. In India the number "three" seems to be in general use. Three Army Commanders under the C.-in-C. with three Area Commands in each and the latter with three or two sub-areas. My experience in the field was that it was most unwise to have more than four fighter squadrons in one wing; with bomber squadrons three were sufficient. Four wings in an R.A.F. group were enough and we never in the field had more than four groups in a Command. The number four is a good average. Operational circumstances forced us at one time to have seven fighter wings in a group and by stepping up the administrative staff of the group we got away with it, but it was too many. If a superior formation has too many individual units to look after, those units will not get the attention they deserve and will suffer. The British Navy's rule used to be a cruiser squadron of four, a battle squadron or destroyer flotilla of eight, but in this case with sub-divisions of four under a senior officer. British Army Groups in the last war had two, and occasionally three armies under them. Armies not usually more than three corps. As I said, the number is flexible, but *four* is a good average for any organization.

A family tree, order of battle, chain of command, or whatever you like to call it, with the name of every unit (or department of staff) on it should be drawn up and given wide circulation. Every unit commander wants to know whom he is brigaded with, who are his supply or signal units, etc. Every department of staff must know what units compose the force they administer or operate; whether they are under direct control or controlled through a sub-formation. If the staff do not know, how can they supply, pay, attend to bodily and spiritual welfare of, technically maintain, etc., the people under them?

In normal peacetime, navies, armies and air forces have usually a fairly settled Order of Battle, but in war, units can be transferred almost daily between commands and lower formations, and just before the Normandy invasion I was issuing complete new Orders of Battle thrice a week to all staff departments and down to unit level.

For lack of an Order of Battle I have known units to be forgotten and fail to get the order for retreat, and be "put in the bag." And I have also known, as a result of forces being dissolved after both wars or after a campaign, that a small unit has been quite lost sight of and has carried on doing nothing and living in peace in some remote spot because the superior staff had forgotten its existence!

The staff department which draws up and issues Orders of Battle may either be "G" or Air Staff, or the Administrative Staff. But the two sections of the staff must work together in the drawing-up process. My personal experience was that the drawing up and issue of the Order of Battle was better carried out by the Administrative Staff after they had received from the "G" or Air Staff the firm order of battle of the operational units. An overall Order of Battle showing the "complete picture" with all administrative units fitted in could then be issued. The Administrative Staff are just as much interested in a supply depot as a front line operational unit—they must have the complete picture.

In the field the provision and issue of a daily unit location statement and a daily state of serviceability of fighting units, men and tanks, or aircrew and aircraft are likewise a necessity. All staff departments need this knowledge and without it good administration is impossible.

If we take it that we have now a "tidy" organization we must see that it functions smoothly, that it is well administered, that every unit, as the Bible says, "can live and move and have its being." It is for the Administrative Staff from the highest level down to adjutants, or first lieutenants of naval units, to see that units can *live* properly, *i.e.*, are well fed, clothed, paid, promoted, medically and spiritually attended to, can move with speed and precision, and can have their being, which I interpret as being able

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to carry out the purpose for which they were formed.

If I may now make a few general remarks from my own experience on the special administration, or the functioning of some of the important administrative departments. They have different names in different Services, but I will talk on them under Personnel and Discipline, Supplies, Technical Maintenance, Movements, Bodily and Spiritual Welfare and, last but not least, Pay. The points I shall mention go, I hope, to ensure good administration.

The Personnel Branch.—A well-led force that has confidence in its leaders of every rank and its staff officers at all levels is capable of anything. It is then a happy force that knows that efficiency is the only path to promotion and awards and that inefficient officers or staff in war are rooted out and not sent to comfortable jobs at the base!

The Personnel Staff has a heavy responsibility here; they must be, like Caesar's wife, above suspicion. They must be firm, but approachable and human. It must not be thought that "string pulling" will get an officer out of a dangerous or uncomfortable job. Confidence in postings, promotions and honours, will make a happy force —the contrary a disgruntled force.

In war the steady flow of trained replacements to fill gaps in the front line is a great morale raiser and needs careful organizing.

The maintaining of discipline is one of the jobs of the Personnel Staff. A human head of Provost Services can help a lot. But a jailer type with a ruthless police force can do immense harm.

The Supplying Branch.—The "Q" or Equipment department. Lack of supplies can immobilize and cause the defeat of any force. The slogan for the Supply Staff is "the right amount in the right place at the right time." "The right amount" means both tonnage and the right specification. It is no use having the right amount of shells with the wrong fuses. The right time and place means having a lot of close-ups in the firing line if you are sure an advance is coming, but having the least possible amount there if you are expecting a retreat. Again, it means a good estimation of how much units should hold, and how much in the pipeline and how much in reserve at the base. Also a good organization to ensure that such supplies and reserves are called forward and moved up quickly from base to front line.

In war the L. of C. is always a headache. It has never the capacity, whether road, rail, sea or air, to bring forward all the men and munitions a commander would like. It is for "Q" to estimate its capacity and tell the commander what force he can maintain at the end of it. And it must be absolutely firm that the user at the forward end calls forward the supplies from the base at the rear. Not, and I repeat not, the base to keep sending forward and clogging the L. of C. with supplies they "think" will be useful.

When Army and Air Forces are working together in the field, the biggest user of the L. of C. must be in charge; the M.G.A. and A.O.A. in the field must come to an amicable arrangement of their proportion of the total tonnage the L. of C. can handle. The M.G.A., as probably the biggest user, then calls forward the total tonnage. But each Service sends its own detailed "breakdown" of its requirements (within the agreed total) to its own supply depots at the base.

A final word on supplies. In any operation of war a "Supply Plan" by the "Q" or Administrative Staff is a necessity before the campaign or battle opens. Otherwise someone will go short before the battle finishes.

The essential data for the drawing up of this supply plan must first be obtained from the "G" or Air Staffs. These data are:

1. The Order of Battle of operational units to be employed. This gives the number of personnel, the number and types of armament and vehicles.
2. The rate of effort expected of these units. (The number of days per week tanks are to be fully employed, the rate of fire expected of artillery, or the number of sorties per day of per week expected of aircraft, etc.)
3. The type of missile to be employed. (Percentage of high explosive to armour-piercing, rockets or bombs, what type of bombs, whether fighters are to use belly tanks on all sorties, etc.)

I cannot stress too much the care that must be taken in drawing up a supply plan. I have gone to the twelfth draft! And it needs the closest liaison between "G" and "Q," or Air and Equipment in the R.A.F.

The Technical Maintenance Branches.—The weight of missiles that can be thrown daily at an enemy depends in modern war on the good maintenance of the missile thrower, whether it be ship, gun, tank or aeroplane. Likewise on the maintenance of the vehicles or ships bringing forward the missiles from the base.

On the organization of a sound repair and salvage plan for all mechanical engines of war depends the daily fighting strength of tanks, guns, ships, aeroplanes that a commander can make use of.

The Movement Branch.—A word on movements. At the beginning of this last war I had hardly heard of the word or department. I rather

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think there was not one in the R.A.F. After four years in the field I have realized that in modern war the ability to move quickly and to move and fight at the same time, and to move reserves, reinforcements and supplies quickly is vital to success. I would say the main cause of the German defeat was their inability to move their forces, whether front line or reserve, quickly, in the last year of the war. Their fuel supply had failed them.

For example, reserve divisions came to Normandy from Paris on bicycles. Senior German Staff officers retreated from Brussels on cart horses, and in the final Russian advance on Berlin the Germans were so immobile that the Russians coming forward in horse-drawn transport could not be stopped.

A good Movements Staff that can deal efficiently with moves of men and equipment by air, water, road or rail is an essential part of good administration.

Senior administrative officers must give their wholehearted backing to *their doctors*; the knowledge that a sick or wounded man is in good hands and quickly back by air in a comfortable base hospital is a great morale raiser. And a good medical organization, with the consequent low sickness rate, increases the daily fighting strength.

Pay Staff.—They need backing; we all know how unhappy we are if we think we are not getting enough pay or our family is getting no allowances.

Catering is vital; a well-fed man is usually a contented man and capable of doing a full day's work.

Welfare is good in driblets but the welfare staff must not think that the only purpose of a fighting force is that it may receive welfare!

Post.—In overseas warfare a good postal and daily paper service is a great morale raiser. But it needs good organizing.

Summing Up.—There are other administrative departments in a big H.Q. but these are the main ones. It is up to the head of Administration to see that he has competent heads and keep them in the picture. To do this he must be in the complete confidence of his commander and know of any possible or likely operation that is in his chief's mind. The Bible says "without vision the people perish," and if the head of Administration does not ensure that the right amount of supplies is in the right place at the right time, then front line troops or air forces *will* perish.

A few words now on "Staff Work." It is staff work that is the oil that makes the administrative machine function smoothly.

What is *good* staff work? My own view is that it is "team work by competent officers." How does one get this team work? I put loyalty to the chief first; without that there will be no team work and no confidence either at the H.Q. or at the units under them. I do *not* put too high a value on brilliance in staff officers; I would much rather choose a competent, hardworking, loyal officer who is a good mixer. If a staff officer thinks himself too superior to talk to his confrères or juniors he will not fit into any team and the force will suffer. A staff officer who visits a unit with his "nose in the air" will neither help that unit nor draw out of the unit information (or gossip) that will be of use to the commander or staff of his own H.Q. Similarly, if "G" and "Q" are not on speaking terms there will be no team work, and lower formations who take their cue from above will likewise be at sixes and sevens.

Delegate responsibility as much as possible. The old business saying, "If you employ him," is good advice. My wartime chief said "Give your juniors full responsibility, but if there is one failure on the operational side, the man responsible must be sacked as that means loss of life. Allow a second chance on the administrative side, but no more!" The success or failure of any force or staff largely depends on the leader's choice of his staff and junior commanders.

On "Minutes": I never write a minute to someone in the same building if I can possibly help it. I either go and see the person or ring him up. There are cases where you have a busy chief whose office you cannot get into, or he is away on a visit, and then there is something to be said for minute writing, but not often. I once found a staff officer writing a long minute to an officer of the same department and same rank in the next-door office with a dividing door in between! He did not do it again!

On the writing of letters and orders. The fewer the better. The personal visit, the personal telephone call, confirmed, if the order is complicated, by signal, will usually be better. For example, I recall that in the six months between the fall of Tobruk and its retaking, which included a long retreat, the Battle of El Alamein and the advance to Benghazi, I wrote two administrative and supply plans, one for the retreat and one for the advance, and six official letters, and I believe that no unit in the desert air force was ever in doubt as to where and when it was to move and where it would find its supplies.

On telephoning. If an officer is not capable of acting on a telephonic order he is of no use. I once had a case in a crisis of an officer saying he must have my telephonic order in writing. I

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told him that all he would get *in writing* from me was an order for him to report to the base as being of no value in the field! A word on telephoning; if in your job it is necessary to telephone more than once to a strange department or Staff Officer ensure that you visit him so that you both know what the other looks like at the end of the line.

Regarding secrecy. Not too much secrecy. I know of far too many operations and supply arrangements that were a failure because those taking part were not "in the picture." There are too many people who say I cannot discuss this on the phone! Over-secrecy in normal day-to-day operations handicaps everything.

There is one vital secret that must be kept at all costs and that is the shape and date of future operations. I speak with experience on this subject as I have been a Director of Intelligence and know what an enemy can and has made use of and what matters little.

The Right Channels.—A good staff officer will find, know and use "the right channels." One is always wanting something; it may be more men, aeroplanes, tanks, repairs, cars, food, whisky, a cheap trip by air on leave, etc. You can generally get them, and quickly, if you know the right channels. There is always someone who deals with your particular want; the thing is to find him, and not his senior or junior (the former will be offended). I was known for some time in the field as "Channels Elmhirst," as I would get up at conferences when I heard a remark by a unit commander that he was short of something, and say "If you or your adjutant had only used the right channel, which was so-and-so, you could have had your request met the same evening."

Politeness.—"Pleases" and "thank yous" in signals or letters from senior to junior formations cost nothing and always pay in enhanced good feeling. And never be frightened of retracting an order, if necessary the same day that it was issued, if you think the order was wrong. It is only the proud and inefficient officer who thinks his prestige will be lowered if he admits by signal or letter that he has issued a wrong order.

On Confidence.—A successful armed force is one where all formations and units in a force have confidence in the other and the commander and staffs that run them. I would always say that it is the duty of the superior formation to gain the confidence of the lower formation or unit and *not* vice versa. Such confidence can best be obtained by (1) the junior staff or unit knowing that the senior staff officers have been selected for outstanding work in lower formations, and (2) by "visiting." Time spent by staff officers on visits to units is never wasted. I have heard many staff officers say that they have so much in their "tray" they could not possibly get away on visits. My answer is "rubbish." Rubbish in the tray, through too much letter and minute writing by the officer, that someone has to answer. A visit will find out what a unit really wants, or why it is a good unit or a bad one. There are many things that a unit will want but not request "in writing," for, as they think, the superior H.Q. are too busy, etc. A visit will also find out whether the C.O. or his staff are good or want changing, also what the unit think of the superior staff—perhaps it is they that want changing! A staff should have sufficient transport to enable officers to visit units when they so wish.

A word on the bullying staff officer. You will always find them, and they want rooting out. They usually bully down the telephone to juniors, who cannot talk back and are usually too polite to their seniors! But they breed lack of confidence and are the negation of team spirit.

And another point: a staff officer should never take his chief's name in vain and use it as a stick to beat the lower formation or unit. "The C.-in-C. is terribly annoyed," etc. If the chief is annoyed, then it is he and he alone who should administer the reproof in person, in writing or on the telephone.

There is nothing a C.O. of a lower formation dislikes more than to be "told off" by a staff officer of a senior formation, more especially if the "rocket" is in writing and signed by an officer of equal or (and I have seen it) lower rank.

A final point on staff work. One of the most difficult jobs of staff officers is to be able to concentrate their attention on the essentials of their jobs. Often a very great number of files and papers to read arrive in their "In" tray, and a lot of it possibly most interesting to "browse" through. But we have all only certain hours of daily work and if we are going to keep our efficiency and health it is inadvisable to stretch these hours too much. My advice is to concentrate on the essentials, "maintenance of the objective," and be quite ready to pass a lot of stuff from the "In" tray to the "Out" tray direct as not touching the job you are established to do. One other point on the daily work of the staff officer. Don't let dealing with the "In" tray be the daily sum of your work. I always say that 75 per cent. of an officer's time should be spent on current affairs, but that 25 per cent. of his time should, if possible, be spent in looking how he can improve the "set up" that he has to deal with. A newcomer to any job should have some fresh ideas that can improve a depart-

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ment or organization and he should not be satisfied with himself when he vacates that job if he has not got something new and valuable incorporated into the machine he has been part of.

And don't *make* work; if you have not a useful function ask to be dis-established.

And finally, it is this building up of competence and confidence, which is staff work, that makes the successful team. The conference where junior commanders sit round a table with their senior commander and his staff are invaluable. And the meals and drinks that precede or follow such conferences add 20 per cent. to their value. Such conferences, whether they be unit commanders with their immediate superior, or specialist staff officers with the head of their Branch or Service, get people together and the juniors go back to their units, I hope, thinking that "the senior formation are quite reasonable human chaps who have a more difficult job than I have"!

To wind up. The title of this lecture is *Administration*. Administration is a dull word, but take it from me it is not a dull business. My four years of it in the war gave me the most satisfying interest of my whole Service career. Little can be more pleasant than seeing the unit, formation or H.Q. that you have shaped and built up, functioning smoothly as a flexible weapon, meeting every call of its operational commander. And it can be just as interesting in peace, when training and administration are the chief functions of a staff officer. And if it is well done it can bring, besides that personal satisfaction, material rewards, like my present job and the herbaceous border on my chest.

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Royal New Zealand Air Force Operations in the Pacific, 1942-45

(*Illustrations opposite page* 160)

By Flight Lieutenant J. M. S. Ross, B.A.

THE active participation of the Royal New Zealand Air Force in the operations against the Japanese in the South and South-West Pacific areas was the result of two major factors. First, New Zealand, in view of the rapid advance southwards of the Japanese in the early months of 1942, urgently required operational aircraft for her own defence. The supplies which could be spared from R.A.F. allocations were insufficient, and it soon became clear that the only basis on which they could be obtained from United States sources would be an understanding that the R.N.Z.A.F. would undertake offensive operations, when the time came, in the Pacific. Secondly, the New Zealand Government considered that it could make a contribution towards economy in the general war effort by sending forces to the Pacific, thus to a small extent releasing American personnel for services elsewhere.

When, at the end of March, 1942, the Pacific theatre was divided into strategic areas, New Zealand was placed in the South Pacific Command under Admiral R. L. Ghormley, U.S.N.* The local defence of the country, however, was excluded from the Command. One of the effects of this was that the R.N.Z.A.F., being nobody's responsibility, had no place in the American scheme of things as regards supply. On representations from New Zealand the directive to the Commander, South Pacific, was changed in September and the R.N.Z.A.F. became a part of his forces. It operated entirely in this Command until March, 1944, when part of the South Pacific area, comprising the Northern Solomons and the Bismarck Archipelago, and the forces operating there, were transferred to the South-West Pacific Command under General Douglas MacArthur.

With the assumption of American command, supplies became better. Throughout 1942, 1943 and 1944, squadrons were formed as aircraft became available, and sent to the forward area, the total number being:

6 Bomber Reconnaissance Squadrons (P.B.O. Hudsons and later P.V.I. Venturas).
2 Flying-boat Squadrons (P.B.Y. Catalinas).
12 Fighter Squadrons (P40 Kittyhawks and, later, F4U Corsairs).
1 Dive Bomber Squadron (S.B.D. Dauntless).
2 Torpedo Bomber Squadrons, used as dive bombers (T.B.F. Avengers).
2 Transport Squadrons (C60 Lodestars and C47 Dakotas).

The latter were based in New Zealand and formed the main means of transporting personnel and freight to the forward areas.

On account of the climate it was found necessary to keep combat aircrew in the tropics for short periods only. This was done by working the squadrons on a rotation system. In the period of intensive air combat, when fighter pilots were flying at the rate of seventy to eighty hours of combat flying per month, the tour of fighter squadrons in the combat area was limited to six weeks. Squadrons leaving New Zealand were given a period of six weeks in a rear operational area on local defence and training, followed by six weeks in the combat area, after which they returned to New Zealand to rest and re-form. As the number of squadrons needed in the support area decreased the length of tour in the forward area increased. In the final stages of the war, when all squadrons were in combat operations, they were spending twelve weeks in the forward area and more time in the rear area. Shortly before the war ended the length of tour was extended to sixteen weeks. The same system was used with the B.R. Squadrons, but the length of tour was more elastic and was longer than that of the fighters. The flying-boat squadrons did not work a rotational system, individual crews being returned to New Zealand for rest after a tour of six months.

The tour of duty for non-flying personnel varied between a year and eighteen months. Consequently it was necessary to divorce aircrew and ground staff. A squadron consisted of the Commanding Officer, Adjutant, Intelligence Officer and aircrew. The maintenance organization was known as a Servicing Unit, and stayed where it was stationed while squadrons came and went. It was under the subordinate command of an engineer officer, who was responsible to a new C.O. every time a fresh squadron was based on his S.U. While this arrangement would appear

*Succeeded in October, 1942, by Admiral William F. Halsey.

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to make virtually impossible any high degree of *esprit de corps* between flying personnel and ground staff it was the best system that could be worked out in the circumstances and there is no record of morale or efficiency having suffered as a result of it.

Bomber Reconnaissance Operations

The first New Zealand squadron to enter the combat area, and, incidentally, the only British unit to take part in the early stages of the Solomons campaign, was No. 3 B.R. Squadron, which arrived at Guadalcanal in November-December, 1942. There were at this time three other New Zealand squadrons operating in the rear areas, No. 4 B.R. at Fiji and No. 9 B.R. at New Caledonia, both carrying out anti-submarine patrols and shipping escorts, and No. 15 Fighter Squadron at Tonga. No. 3 Squadron had spent six weeks at Espiritu Santo *en route* from New Zealand, doing patrols and acclimatizing itself to tropical conditions. On arrival at Guadalcanal it was attached to the Air Search and Patrol Group, under the command of Senavguadal (U.S. Senior Naval Aviator, Guadalcanal).

During the Guadalcanal campaign, which lasted from August, 1942, when the U.S. Marines first landed on the island, until the second week in February, 1943, when the Japanese finally evacuated it, the American command used its air forces as a primary offensive and defensive weapon. The major tasks were to prevent reinforcements reaching the Japanese on Guadalcanal itself, and the disruption of forces gathering in the South Bougainville/Shortlands area for a counter-offensive. At the same time continuous attacks were made on the advanced bases and airfields which the enemy was developing, particularly on New Georgia and Kolombangara.

The operational role of the R.N.Z.A.F. squadron was limited by its equipment. The Hudson was inferior in range, armament and bomb load to the aircraft flown by the American bomber squadrons in the area, and consequently the squadron was rarely employed on bombing strikes or on missions over land areas where heavy air opposition was to be expected. Its main work was searching for enemy shipping and submarines in the area to the north and west of Guadalcanal.

The first source of information regarding enemy movements in the Northern and Central Solomons was the Coastwatchers who were stationed throughout the islands in hideouts in the jungle overlooking nearly all the main Japanese bases. Their information was supplemented by reports from reconnaissance aircraft. When enemy shipping was located by a patrolling aircraft its position was reported to base and a force of bombers sent out to deal with it. Targets were plentiful at this time. From 24th November, 1942, to 9th February, 1943, aircraft of No. 3 Squadron averaged six patrols daily. They made forty-six sightings of enemy shipping in the period, involving a total of 194 ships ranging from battleships to schooners. On three occasions they attacked with bombs, and one Hudson was credited with having probably damaged a submarine.

Contacts with enemy aircraft were fairly frequent. In all, 109 were sighted during the period. On nine occasions fighters attacked the Hudsons which, on account of their poor defensive armament, avoided combat whenever possible. This was usually facilitated by the large formations of cumulus cloud which normally form in mid-morning in the area and last throughout the day.

Following the Japanese withdrawal from Guadalcanal, the only Allied advance for some months was to the Russell Islands, fifty miles to the north, which were occupied without opposition by American forces on 21st February. There they established air strips from which it was possible to provide fighter cover for bombing strikes against the next main objective of the campaign, namely, the enemy bases of Munda and Vila, on New Georgia and Kolombangara respectively. Until the end of June both sides settled down to attritional warfare, the Allies building up their strength at Guadalcanal and the Russells, and the Japanese trying to develop their southernmost outposts in the New Georgia area. The balance of operations was in favour of the Allies. As a result of the continuous and mounting Allied air activity the enemy was increasingly unwilling to risk his shipping south of Bougainville, and most of the sea traffic between there and New Georgia was by barge.

No. 3 Squadron's main work continued to be shipping patrols, but for some months the monotony of these was lightened by a variety of odd jobs. Individual aircraft flew over the Japanese bases in South Bougainville on weather reconnaissance prior to American bombing strikes. Others accompanied night bombing raids, acting as navigation leaders and dropping flares at intervals to guide the bombers on their way. On occasion they carried out nuisance raids themselves, dropping bombs by night on Munda and Vila. During the routine patrols, aircraft came across targets they could profitably attack. One destroyed an enemy submarine in April and a number sank troop-carrying barges. The arrival of an American squadron of P.V.Is. at Guadalcanal in August, which took over all the odd

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jobs, relegated No. 3 Squadron once more to its purely reconnaissance role. In this it continued until relieved by No. 1 Squadron towards the end of October.

Meanwhile No. 9 Squadron had moved up in March from New Caledonia to Espiritu Santo, where it was engaged in shipping escort work and acted as a reserve for the forward squadron.

No. 1 Squadron, equipped with P.V.Is., took over No. 3's daily search commitment, which by October was on a reduced scale. From June onwards, sightings of enemy shipping in the Central Solomons had declined sharply. The squadron also took part with American light and medium bomber units against Japanese positions in Bougainville. The enemy had been cleared out of the New Georgia area in August-September, and the Allied development of the airfield at Munda made it possible for fighter-escorted bombing forces to stage through there from Guadalcanal on their way to soften up the Bougainville bases preparatory to the American landings at Torokina. From the end of November, No. 1 Squadron maintained a detached flight of six aircraft at Munda for the purpose of the Bougainville strikes.

On 1st November U.S. Marines landed at Cape Torokina, on Empress Augusta Bay, Bougainville, and established a perimeter. Three and a half weeks later an airstrip had been built and was ready for use. Henceforth it was possible to reach Rabaul, the main Japanese base south of the Equator and the objective of the whole Solomons campaign, with land-based medium bombers and fighter escort.

Towards the end of December a major air offensive was launched against Rabaul from Bougainville. By the end of February the Japanese had been forced to withdraw practically all their air strength from the area, and to cease using the harbour for shipping. From then until the end of the war the enemy troops there were forced to maintain themselves with practically no reinforcements of either personnel or supplies. During the period of maximum attack the R.N.Z.A.F. B.R. Squadron played little direct part, being employed mainly on patrols from Guadalcanal and barge-hunting sorties round the coasts of Bougainville and New Ireland from Munda. It carried out a number of strikes on specific targets—barges, troop concentrations, supply areas, bridges, etc., and on other occasions ranged over the Bismarcks—Solomons area looking for targets of opportunity.

In February, No. 1 Squadron was relieved at Guadalcanal by No. 2, which in April moved up to Bougainville for a month before being in turn replaced by No. 9, then on its second tour of operations.

In March, New Zealand bomber representation in the Solomons was increased by the addition of No. 30 Squadron, which operated with T.B.Fs. from Bougainville until the end of May, when it was relieved by No. 31 Squadron. Late in March, No. 25 Squadron also started operating from Bougainville, equipped with S.B.Ds. All three took part in dive-bombing attacks on Rabaul and on enemy positions on Bougainville. During March, when the Japanese launched a determined attack on the Allied perimeter at Torokina, armourers had the pleasure of bombing up aircraft and seeing them drop their loads on enemy gun positions only a few hundred yards from the airstrip. All three squadrons were withdrawn after one tour of operations, in accordance with a policy of reducing the number of aircraft types in the R.N.Z.A.F.

By the end of March, Rabaul was surrounded by Allied bases, and the strategic campaign for its elimination came to a close. American troops were firmly established in Western New Britain and Bougainville. To the north, the Admiralty Islands and the St. Matthias Group were occupied and airfields were built on them. The development of an airfield on Green Island, to the north of Bougainville, gave the Allies a base from which fighters could operate against Rabaul without the necessity of carrying extra fuel tanks. There were still strong enemy ground forces in the area, especially in Eastern New Britain, New Ireland and Bougainville, and for the next eighteen months the task was one of containing them and endeavouring to exterminate them. The Allied forces in the area were loaned by the Commander South Pacific to the Commander South-West Pacific (General MacArthur) for the job, while Admiral Halsey turned the main weight of his attack farther north, against bases nearer Japan itself. On the ground, Australian troops took over in Bougainville from the Americans, while in the air the R.A.A.F. and the R.N.Z.A.F. worked together with a reduced number of American squadrons. From October, 1944, until shortly before the end of the war, New Zealand B.R. representation in the area was increased from one squadron to two with another on garrison duties farther south at Guadalcanal.

Up till the end of 1944 the New Zealand P.V.I.'s operations consisted largely of low-level bombing and strafing sweeps against targets of opportunity. When this became uneconomical owing to the lack of suitable targets, their activities were diverted to medium level bombing strikes against selected targets. In many instances the attacks were made in conjunction with American P.B.Js., and until the P.V.Is. were fitted with satisfactory bombsights in April,

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1945 they were always led in their medium level strikes by a P.B.J. which acted as bombing leader. The bombs used depended on the target to be attacked, and also to a large extent on what supplies were available at the time. The standard bomb for the B.R. squadrons was the 500 lb. G.P., and when these were in short supply 350 lb. and 325 lb. depth-charges were found to give good results on bridges, buildings and transport concentrations.

In addition to their bombing and strafing sorties the B.R. squadrons sent single aircraft nightly over the Rabaul area on "night heckles," the aircraft flying round for an hour or two and dropping a bomb every now and then to keep the Japanese awake.

Fighter Operations

The first R.N.Z.A.F. fighter squadron to go overseas in the South Pacific campaign was No. 15. It was posted to Tonga in October, 1942, and took over and operated P40 aircraft which had (with admirable good sense in view of their condition) been thrown up by No. 68 Pursuit Squadron, U.S.A.A.F. The squadron trained on them and carried out uneventful patrols round the coasts of Tonga and Fiji until April, 1943, when it was moved to Espiritu Santo. From there, rearmed with more serviceable P40's taken over from No. 14 Squadron, R.N.Z.A.F., which had arrived in March from New Zealand, it moved to Guadalcanal and so was the first R.N.Z.A.F. fighter squadron in the combat area. There it was engaged in patrols over Guadalcanal itself and over the Russell Islands, in convoy escorts, bomber escorts and offensive sweeps over enemy bases to the north. At this period the American Command made a practice of sending fighter sweeps over enemy bases "to clear the air" before the arrival of bombing strikes. On occasions, in addition to disposing of air opposition the fighters strafed anti-aircraft positions, giving the bombers a chance to drop their bombs with a minimum of interference.

In the second week of June the enemy attempted to take the offensive, sending sweeps of forty to fifty fighters, evidently reinforcements from Rabaul, over the Russells on the 7th and 12th, while on the 16th a mixed force of 120 bombers, dive-bombers and fighters attacked American shipping off Guadalcanal. On each occasion the Allied Command was able to put up approximately 100 fighters to intercept them. In the three engagements some 126 enemy aircraft were shot down in combat for a loss of twenty-one Allied fighters. Of this total, New Zealand pilots destroyed fifteen for the loss of one pilot and six aircraft damaged. In the action of 12th June eight pilots of No. 14 Squadron, which was in the process of relieving No. 15, enjoyed their first battle and shot down six enemy aircraft for the loss of one.

During the fighting on New Georgia, which lasted from the beginning of July until early in August, R.N.Z.A.F. squadrons formed part of the continuous fighter patrol which the Allied Command kept over the area during daylight hours. The primary role of the patrol was to protect the American troops ashore and the convoys in the area from enemy air attacks, and it also furnished cover for most of the light bomber attacks on the enemy airfields at Munda and Vila. The Japanese reacted strongly to the Allied offensive on New Georgia, and in the first week made eleven air attacks in force and several on a smaller scale. They were notably unsuccessful. In the eleven major engagements during the week, Allied fighters shot down over 160 for the loss of twenty-nine. Of these the R.N.Z.A.F. got eleven.

Munda was finally captured by American troops on 5th August, and nine days later the airfield was in operation. The result of this was that the Allies had a base only 120 miles from the main Japanese bases at Kahili in Southern Bougainville and on Ballale Island. These were attacked with increasing severity by American bombing forces, and the enemy found it progressively harder to keep up his opposition. In consequence he was forced to withdraw his air forces from the Solomons and by the end of the year the Allies were in complete control of the area. Throughout September and October the chief task of the R.N.Z.A.F. fighter squadrons was escorting bombing strikes on Kahili and on the remnants of the crumbling Japanese Defence System in the Central Solomons.

In mid-September the New Zealand fighter strength at Guadalcanal was increased from one squadron to two, while a third was stationed at Espiritu Santo on local defence duty. In October the two squadrons moved from Guadalcanal to Ondonga, an airfield which had been developed five miles north-west of Munda on New Georgia. There they operated, until January, 1944, as the R.N.Z.A.F. Fighter Wing. From there they escorted bombers over targets in Bougainville and Choiseul, and assisted in providing cover over the American landings at Empress Augusta Bay at the beginning of November.

The opening of the strip at Torokina in late November brought land-based fighters for the first time within range of Rabaul. On 17th December the R.N.Z.A.F. Fighter Wing took part with American squadrons of F6F's and F4U's in the first fighter sweep over the area. The squadrons operated from Ondonga, staging through Torokina and refuelling there before the

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actual sweep. The operation was entirely successful and proved that, given sufficient strength, Allied aircraft could operate successfully over the enemy's major base south of the line. Two days later the first escorted bomber attack was made by Solomons-based aircraft, New Zealand Wing providing the close cover. Thereafter, the scale of assault against Rabaul rose steadily and the Wing took part in every major attack.

On 17th January, 1944, the Wing moved forward and was based at Torokina. When weather permitted it flew daily in conjunction with American squadrons on strikes against Rabaul and on sorties round the coasts of Bougainville and the adjacent islands. By the middle of February, Japanese air power was eliminated in the New Britain—Bismarcks—Solomons area, and fighter escorts for bombers became redundant. In consequence, the fighter aircraft were modified to carry bombs instead of belly tanks, and changed their role to that of fighter-bombers. They were able to carry bombs to Rabaul—the first operation taking place on 7th March—by refuelling at Green Island, which had been captured by New Zealand troops in February.

For some months Bougainville remained the most northerly base from which the R.N.Z.A.F. operated. By the end of 1944, however, there were New Zealand squadrons also operating from Green Island, Emirau and Los Negros, and in April, 1945, New Zealanders first operated from Jacquinot Bay on the south-east coast of New Britain. From mid-1944 the fighter squadrons were rearmed with F4U's. At the beginning of June a third fighter squadron was based at Bougainville, and in September a fourth. By April, 1945, as a result of reduced commitments in the garrison areas to the south, there were eight R.N.Z.A.F. fighter squadrons in the Northern Solomons—Bismarck area.

Of these, all except those based at Emirau and Los Negros took part in the continuous attacks on Rabaul which were designed to harass the enemy and keep him on the defensive. In addition, the squadrons on Bougainville were engaged at first in local defence of the Allied perimeter and later, when the Australian Army took over from the Americans and started offensive operations with a view to driving the Japanese off the island, in close co-operation with the ground forces. In this role they were signally successful, achieving a high degree of accuracy in bombing and strafing enemy strongpoints in front of the Australian lines.

Operational control of all squadrons was vested in the local area commanders, who might be either American or New Zealand. In the early stages they were under the direct control, through the local Commander Aircraft, of Commander Aircraft Solomons. In mid-1944 the additional appointment of Commander Aircraft Northern Solomons was created, and he took over the direction of all attacks against Rabaul. When, early in 1945, the Northern Solomons area and Command was transferred from the South Pacific area to the South-West Pacific area, they came under the direct operational control of the Commander Allied Air Forces South-West Pacific area. In July, 1945, the Northern Solomons area was transferred for operational control to the Royal Australian Air Force Command, and became known as Islands Area within that Command. The A.O.C. Islands Area and his staff were R.N.Z.A.F., under the operational control of A.O.C.-in-C. R.A.A.F. Command.

Throughout the war the relations between R.N.Z.A.F. units in the field and the Allied forces with whom they worked were most cordial, and were marked by a high degree of mutual assistance and co-operation. This fact rendered possible the harmonious prosecution of operations in an area where a local commander might have under his control units of the R.N.Z.A.F., R.A.A.F., U.S.A.A.F. and U.S.M.C.

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Assisted Air Defence

By J. M. Spaight, C.B., C.B.E.

It is a sign of the times that in the international dance of power-politics there is to be seen a setting to partners whose attractions are partly economic, partly strategic. It is to be seen both to the east and to the west of the iron curtain, and countries which have assuredly no thought of aggression are engaged in it. Take Britain, for instance. In the recent war she was described by Nazi propagandists as a kind of aircraft carrier moored off the Continent of Europe, and the simile was not altogether an unhappy one. In a future war she may have to serve the same purpose, and she naturally looks about her for means of improving her position both as a receiver and as a giver of blows. Her own security would be jeopardized if she were unable to ward off the onslaught of a European or semi-European Power which was in a position to subject her to vicious air attacks.

Such attacks are to be expected in any new conflict. The idea that air power has lost its importance in view of the introduction of newer forms of assault is an unsustainable one. Guided missiles and other revolutionary weapons may be coming, but their day is not yet. Within our generation not much more is to be expected from them than the very limited success which they achieved in 1944-45. There is no reason to believe that the slate which records the experience of that time has been wiped clean by the sponge of scientific development or that everything that happened then is now only of academic or historical interest and devoid of practical importance.

Marshal of the Royal Air Force Lord Tedder had something to say on this subject in an interview which he gave to Press correspondents on 10th September, 1946, when he said:

"You may say that if there is another war it will be fought with guided rockets travelling 1,000 miles and more and carrying atomic bombs, with bombers and fighters all as dead as the dodo. Some time, perhaps, but not yet; we must live in the present while keeping pace with future possibilities. . . . A bomb is just a bomb whether it is an atomic bomb or a grand slam. Recent scientific developments have not superseded but have enormously enhanced air power."

A similar view was expressed in regard to the effect of atomic warfare on air defence and offence in the *Third Report of the Commanding General of the United States Army Air Forces to the Secretary of War*, in November, 1945. General H. H. Arnold then said:

"The influence of atomic energy on air power can be stated very simply. It has made air power all-important. Air power provides not only the best present means of striking an enemy with atomic bombs, but also the best available protection against the use of atomic explosives."

If the air had lost its importance the principal countries of the world would not be spending the enormous sums which they are upon their air forces. The increases since 1930 have been striking. In that year, for instance, Britain devoted a sum of £17,850,000 to her air establishments for the year, and this included the provision for civil aviation. She is spending £173,000,000 upon the Royal Air Force in the financial year 1948-49; civil aviation now falls on a different vote. The strength of the Royal Air Force in 1930-31 was 32,000 officers and men. It is now 325,000. These ten-fold increases are matched by figures of growth in the cost and size of the United States air forces of still greater magnitude. In addition, the American carrier force has grown to proportions which would have been regarded as fantastic in 1930.

It is perfectly clear that the Governments concerned are very far from accepting the view that the day of air power is drawing to its close. It has not, indeed, reached its noontide as yet. The next war will be a war in the air in a truer sense than the last war was, and the blows from the air will be more devastating. For that reason it will be more important than ever to safeguard the main base of each belligerent from the enemy's overhead assault. Defence against hostile raiders will be the first and most pressing of the preoccupations of the war cabinets of the States involved in hostilities.

Any political measures which serve to facilitate and augment that defence will naturally be welcomed by the statesmen of the countries which think themselves threatened. They will not be satisfied, if they are wise, with the kind of security which is afforded to them by the Charter of the United Nations. They will ask for something more definite and more certain than a promise of help which will materialize only after interminable palaver in the Security Council, and then possibly not at all if a Great Power chooses to interpose its veto. They will

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P40s in servicing revetment, Ondonga, November, 1943.

Servicing crew at work, Espiritu Santo, November, 1943.

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Hudsons on patrol, Guadalcanal, January, 1943.

Torokina strip.

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Torokina strip, Mt. Bagana, active volcano, in background.

PV1s of No 2 Squadron in servicing revetment, Torokina, May, 1944.

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Bombing Rabaul, February, 1945: No. 2 Squadron.

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want help on the nail when the need for help arises. They will want, in fact, an alliance, an undertaking without qualifications, an unconditional pledge of immediate and effective support against any aggressor.

If the action contemplated is to be speedy and certain—and it must be in these days if it is to be of real value—the agreement must be a geographically circumscribed one. It should not be one for action all over the globe, as the Charter is. The Charter thinks in terms of universal peace. An alliance thinks in terms of the defence of a limited part of the world. The action will be most effective if it is confined to a defined zone. The peoples in that zone will have an interest in stopping a disturber of the peace within it which they would not have under a more far-flung guarantee. A war in the zone would be trouble on their own doorstep. The danger of default among the guarantors would be less. Moreover, the aid which they promise could be given more swiftly, because the place where it was required would be nearer at hand.

That is especially true of aid in the air. Air forces can go into action more expeditiously than other arms but only, in general, from their home bases. They cannot be expected to be equally quick off the mark in all parts of the world. Ship-borne aircraft cannot have the hitting power of land-based bombers, and in any case aircraft-carriers cannot be ubiquitous. Now, the air arm is peculiarly fitted to be the first echelon of a force of collective security—a fact which is recognized in the earmarking of air contingents provided for in Article 45 of the Charter itself. So, too, in any regional arrangement it is to the airmen that will fall, in all probability, the duty of observing and checking an aggressor's initial advance, and that duty will be performed the more effectively the more restricted is the area in which they have to undertake it.

The commitment will be limited in another way also. It will be one which, as in the traditional form of defensive alliance, envisages a concrete *casus belli*. It will provide for action to be taken in the event of an actual attack upon any of the allies. The Charter goes farther than that. It provides for intervention at an earlier stage, the stage of a threat to peace. That is, of course, all to the good if the intervention has the effect of staving off an outbreak of hostilities. The difficulty is that a threatening situation is at once hard to define and hard to recognize, and discussion is normally necessary before the existence of it can be determined. That means delay, when every minute counts. There is no doubt or uncertainty about an actual attack. It is a fact that cannot be gainsaid.

But, it will be said, any assistance will be too late if the attack is awaited. The first, the aggressor's blow may be fatal. It may end the war at a stroke, making the victim's continued resistance impossible. Just the same was said before 1939 of the possible effect of the initial attack with explosive, incendiary and gas bombs. A 48-hour war was predicted. It did not come to pass. Nations are, on the whole, remarkably tough. They can take a lot of hitting. Japan's collapse under the atom bomb is not proof to the contrary; she was already prepared for surrender after three and a half years of war.

It is because the Anglo-Franco-Benelux treaty signed at Brussels on 17th March, 1948, takes account of the more vital requirements of defence in this air age that it is more realistic than the Charter of the United Nations. It recognizes, that is to say, that the assistance afforded by a security scheme must be certain to come, must be prompt in coming, must come in a form calculated to save the State attacked from a continuance of damaging blows at its heart. It makes a distinction, therefore, a necessary distinction between two areas in which a party to the pact may be a victim of aggression. One area is Europe, the other is the rest of the world. If an armed attack occurs in Europe, the other signatory States must at once come to the victim's help with "all the military and other aid and assistance in their power." There is no waiting, no deliberation, no trying of milder sanctions first, no veto. The help asked for must come immediately, and because only Europe is in question it can come hot-foot on the aggression, for it can come, and will almost certainly come, by air. If the aggression occurs outside Europe the parties will consult together as to the aid to be given to the party whose (extra-European) possessions or forces are attacked or threatened; there is no automatic obligation to assist in this case. There is neither the compelling need for speedy action nor the facility for taking such action as there is in the case of an attack at "home."

Of course, if the assistance pledged is to be prompt and effective, the measures involved in the rendering of it will have to be organized in advance. Detailed arrangements will have to be made beforehand and plans for joint action in various emergencies will have to be agreed. How the forces of the States concerned will combine with or support one another will have to be settled. Co-operation between the air forces of the Brussels Powers should present no great difficulty. In the recent war, French, Belgian and Dutch squadrons served without linguistic or other troubles in the British air service, and that comradeship in arms should be a happy augury

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for the future. Already there is a certain amount of standardization in the equipment of the air services, liaison has been maintained and there have been reciprocal visits between the Services. The beginning of an "international air force" is here discernible.

Britain's own position will undoubtedly be strengthened as a result of the conclusion of the treaty of Brussels. She will have acquired what she lacked in 1914 and 1939: a foothold in the Low Countries and the opportunity to plan and organize her defence on a line which should keep the enemy at a greater distance from her shores. That will be a valuable advantage, more especially for purpose of air defence. The availability of radar and other warning posts and the use of airfields in the Low Countries as well as in France will make interception of enemy raiders easier than in the last war, and British bombers will be able to strike in their turn from bases nearer to an eastern European enemy's centres. The next "Battle of Britain" may well be fought by jet-propelled, all-wing fighters, moving at supersonic speed, somewhere in the stratosphere above a line from Ghent to Aix. A revived French *Armée de l'Air* will extend the line on which the defence of the West can be maintained and the grand assault can in its turn be launched against an eastern aggressor. That assault will become overwhelming in its sweep and volume if history repeats itself and the magnificent American Air Force returns to fly once more beside its old comrades in arms.

Such a massive array of air power should be a bastion of defence for the West. How could any invasion be maintained in face of it? We know how the American and British bombers wrecked Germany's whole transportation network in the winter of 1944-45. They paralysed her railway system in "Operation Clarion" at the end of February, 1945, and that was only one of a whole series of operations against her communications. General H. H. Arnold has told what happened in a graphic despatch (*Third Report of the Commanding General of the Army Air Forces to the Secretary of War*):

"Operation Clarion was a 'milk run.' All over Germany bombs exploded on signal control points, marshalling yards, main lines, level crossings, embankments, bridges, viaducts, roundhouses, over-passes, small junctions. Fighters and fighter-bombers attacked rolling stock. Herr Dorpmuller's rail repair organization was swamped. Immediately, according to General Buhl, war production was cut in half. General-Major Peters said traffic was reduced 90 per cent. 'Operation Clarion' marked the end of large-scale mobility for the German Army."

An invader from the east should never again be able to pierce the (reorganized) defences of the Low Countries and France as easily as the Germans pierced them in 1940. He will not have behind him, in any foreseeable time, such a wonderful system of military transportation as Germany had built up over many years. That that system was smashed in pieces by the hammer-strokes from the air is one of the lessons of the war which strategists will not forget. It is an encouraging lesson for the peace-loving peoples who wish only to stay within their own frontiers and whose interest it is that invasions should not be successful.

The American Air Force may well be seen flying with other old comrades in another and very different theatre of war. It may be in operation along with the Royal Canadian Air Force in the far north of the American continent. It is there that some future decisive battle of the world may be fought, a battle as momentous as Chalons or Tours, destined like them to save western civilization from the semi-Asiatic swarm that may be again threatening it from the east. It will be fought with weapons which would have made Theodoric and Charles Martel gasp and stare. It will be predominantly a battle in the air. Atomic bombs may conceivably be used against ground targets, but the odds are heavily against an enemy's having them to use. In any case, an enemy who started atomic warfare against the United States, or any country or group of countries likely to be assisted by the United States, would be fit only for a mental institution. Everyone knows who holds all the trump cards in that grim game.

Alaska, the base of the 11th United States Army Air Force in the war with Japan, is one of the pivotal points of air power in the world. It is the north-western outpost of defence of the American continent. If an enemy could gain possession of the air bases at Fairbanks, Anchorage or elsewhere in that territory, he could threaten the vital centres of Canada, the United States, and even countries to the south, could interrupt the Alaska Highway, could interfere with the mining of uranium in the far north of the Dominion. Possessing Alaska, the United States could strike at Vladivostok, Archangel, Moscow and other centres of population within the 4,000-mile radius which the super-bombers of the future will take in their stride. Great-circle flying over the top of the planet has given it, viewed from the angle of strategy or communication, a disconcerting tilt. Our maps will need to be redrawn to make the change apparent to all of us.

It is because "America faces north," as Major G. F. Eliot has said, and no longer east and west, as she did when Germany and Japan were

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armed and menacing, that the defence of the United States and that of Canada are indissolubly interlinked. Major Eliot goes on:

"It seems hardly necessary to say that we must for the immediate future maintain the very closest and most special sort of relationship with the Dominion of Canada, making joint military plans, carrying out joint exercises, integrating our military forces and our systems of military education as far as possible, and so in every way working hand-in-hand for the security of North America, which is the security of both nations. Neither can for a moment of the future be secure without the other."—*The Strength We Need*, page 130.

It is not, however, the north only that the American sentinels are watching. They are looking eastward, too. The same menace as that which is seen to the north may come by degrees and more insidiously from another direction. They are alive to the danger. It is well that they should be—well for them and for us. It gives us hope that if it came to a conflict between the western democracies in Europe and the only Power with which they might not be able to cope by themselves, the only Power from which any serious danger is to be apprehended, America would stand behind them in the fight. The tremendous fact which distinguishes the present situation from that of thirty years ago is that this time the United States is in Europe and means to stay. Long may she do so. While she remains there will be no war that matters, and no need for action under pacts for assisted defence. We can have that hope because the dark and ominous line of the iron curtain is not the only one stretching across Europe. There is, facing it, a line of light and promise, a line maintained, we are screamed at from Moscow, by war-mongers and reactionaries, a line maintained in reality by freedom-loving European nations and another and greater nation that belongs neither to Europe nor to the eastern hemisphere, a nation that has liberty in its blood. If these nations proclaim with one voice: "No war west of the twelfth degree of East Longitude"—well, there will be no war west of the twelfth degree of East Longitude. There will be peace in that breeding-ground of wars, and unbroken peace is the surest defence of all.

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Royal Air Force Morale and the Changing Concept of Discipline

By Squadron Leader Barry Sutton, D.F.C.

Synopsis

THE democratic way of civilian life, even before the new emphasis given to it by the contemporary trend of politics, had begun to change the Service man's attitude towards a Service discipline which has hitherto been rooted firmly in a tradition of autocracy.

Whether or not this change is for the eventual good or not may, perhaps, best be judged by its effect on morale.

The conventional basis of Military Discipline is force (in the form of fear of punishment) rather than persuasion. Such a concept is now out of tune with the times. Nevertheless, a reaction from old ideas leading to the acceptance of a discipline founded too much upon persuasion will be bad for any Service.

The R.A.F. cleaves to the old tradition of barrack-square orthodoxy in its training establishment; yet, in the Service as a whole discipline is, by the standard of other fighting services, lenient.

In the past, and in particular during the late war, the high morale of any British fighting Service could be taken for granted. Now that, in peace, the very foundation upon which that morale was based has shifted in accordance with a nation-wide change in men's ideas of discipline, it would be unwise to take high morale for granted. Is the R.A.F. in its secession from military orthodoxy going too far the other way?

Introduction

The present period in the history of the Royal Air Force is remarkable for the nature and scope of the changes which are being instituted in the serving conditions of officers and men. The democratic way of civilian life, even before the new emphasis given to it by the contemporary trend of politics, had already begun to influence the Royal Air Force which, like the other fighting Services, was rooted firmly in a tradition of autocracy. Under the impact of these changes in men's ideas, a new concept of service discipline is being fashioned.

Since it is without precedent, it is unforeseeable whether this change is for the eventual good or not. But we may come near to forming an opinion by examining the effect of the change on the one quality which is the very life blood of any fighting service—the quality of morale.

The Relationship between Morale and Discipline

First we ought to try to determine the nature of morale itself; and in thinking about the morale of such a Service as the Royal Air Force, we must bear in mind that it is necessary to think, not about any single section of its personnel such as aircrew, but about the Service as a whole.

Morale has been described as the general spirit or state of mind of a group of men as reflected by their behaviour under all conditions. A high state of morale is said to inspire men to rise to heights of achievement which they could not attain by professional skill alone. It is an intangible quality, hard to define; and perhaps more vivid than all dogma about morale, are the classic examples of it such as are given in the epic literature handed down from the ancients, or in the history of wars of more modern times. When nearly 5,000 years ago a Chinese wrote

> "Stubborn and steadfast to the end, they could not be dishonoured
> Their bodies perished in the fight; but the magic of their souls is strong—
> Captain among the ghosts, heroes among the dead,"

he was expressing an idea in the very idiom of our own heroic literature. Whether they are sung by the poets of ancient China, or by the poets of our own day, the tales and songs of courage stir the hearts of men where the objective analyses of the psychologists and metaphysicians cannot.

Just as it is difficult adequately to define morale in absolute terms, so it is difficult to define the factors which contribute towards it. There is no formula which will develop an atmosphere favourable to morale. There are only general precepts. But these alone cannot resolve the imponderables of any future situation; the answer ultimately must always come from the inspiration of those in authority, and must be expressed through their own personalities. They must, as we say, display qualities of

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leadership, which is fundamentally the act of maintaining morale.

What are those precepts which, although they do not provide a complete answer to the problem of building up morale, are too important to be disregarded? First, there is the principle that there are two sentiments which do most to develop a high standard of morale—patriotism and pride of service. Pride of service, in turn, may be said to depend on the inculcation of habits of discipline. Secondly, there is the principle that the true basis of discipline is a state of willingness, cheerful obedience and enthusiasm.

The Shifting Balance of Discipline

To substitute force completely by persuasion in a fighting service is to change the centre of gravity of discipline, nothing less; yet there are already signs that such a change is taking place in the Royal Air Force.

If balance is to be restored new forces must be applied in different ways. Now is the time to review old methods founded on a tradition which is outmoded so far as the democratically minded world outside the Services is concerned.

Discipline in the Royal Air Force was founded on a military tradition. Nevertheless, in recent years, and particularly in the years following the expansion period after 1938 the Royal Air Force tended to modify its approach to the method of enforcing discipline along lines which, *vis-à-vis* those of the other Services, were lenient. An attempt now to revert to the more rigid and traditional orthodoxy of certain Army formations, such as is well exemplified in its extreme form by the Brigade of Guards, may succeed in producing an outward show of smartness conforming to the spirit of the parade ground; it might also have a favourable effect in raising the *esprit de corps* of certain groups of airmen whose psychological make-up is similar to that of Guardsmen. On the whole, however, such an experiment is unlikely to succeed as must any conscious attempt to change men's ideas. Further, an attempt to revert to older and more extreme methods of enforcing discipline would probably lead to detrimental effects, not only on morale, but on the general efficiency of the Royal Air Force. Field-Marshal Montgomery has said that discipline strengthens the mind so that it becomes impervious to the corroding influence of fear. But he has also said in the same context that it teaches men to confine their thoughts within certain definite limits. For the soldier, whose active service is, in the main, physically more arduous than that of the airman, such an aim is justified. To the airman, who has become essentially more of a technician than a fighting man, it may be disastrous.

Here, then, there becomes apparent an important difference between the function of discipline in the life of the soldier and in the life of the airman. The primary object of discipline in the Army is the conquest of fear in battle—although it may be argued that the modern soldier is also a technician, he is nevertheless primarily a fighter. Not so the airman.

The methods of achieving a particular kind of discipline which will combat not only fear, but technical inefficiency as well, may be by conventional military standards—and indeed the tradition of the older Royal Air Force—somewhat less stringent and violent. This is perhaps because they are not concerned primarily with an appeal to so elemental and powerful an instinct as self-preservation, though, in this respect the reason is perhaps fortuitous.

The Royal Air Force's aim is more in line with the spirit of enlightenment which may be considered, if not as a corollary to democracy itself, at least something that is best intended in such a system. It is an aim which will appeal most to the man of intelligence, and it is men of this type which the Royal Air Force, more than any other fighting Service, needs in the body of its ranks. Since the aim is different, there is justification for different methods. This, in part, explains the break that has already been made with orthodox military tradition in the enforcement of discipline. But while the Royal Air Force has seceded from such a tradition it has failed to formulate its own clear-cut concept which will serve as a satisfactory foundation to a tradition of its own.

A study of the career of the average airman provides many examples of inconsistency in Service regime so far as his discipline is concerned. As a recruit he is given a thorough grounding in arms drill and marching drill. While undergoing training as a technician he finds that standards of discipline are relaxed a little. By the time he reaches an operational unit or a station, discipline is relaxed still more, until the stage is often reached where he works and lives under a quasi-military type of discipline which is compounded as much of the democratic principles which determine the working conditions of the factory worker as of the traditional principles governing the way of life of a member of a fighting service.

So far as the airman is concerned the implication of a discipline which is founded on such principles may appear wholly favourable. His rights are guarded more jealously than was possible under any orthodox military system. His hours of work are fixed. He has an adequate measure of protection from whatever he may consider are injustices meted out by his superiors.

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If he considers an order unreasonable, or his treatment at the hands of an officer unfair, he may demand the intercession of any other officer of his own choice. Outside his working hours he has a degree of liberty equal to that of the factory worker. He no longer, now that he has left his school, has to spend hours polishing buttons, "blancoing" webbing, cleaning boots. In his relations with his superior officers, particularly with his non-commissioned officers, he is on terms of easy affability—terms which are analogous to the relationship between the civilian workman and his foreman. He regards his work rather than his bearing—once he has, as it were, "come of age" by leaving his training—as the criterion of his efficiency. He is no longer drilled. He is no longer required to march. He is not compelled to play team games. He regards freedom and dignity of the individual as all-important. He knows not that discipline "which strengthens the mind so that it becomes impervious to the corroding influence of fear," and because, it seems, he is not concerned with fear now that his weapon is the spanner and not the bayonet, he has no need to "confine his thoughts within certain limits." Discipline, for him, is founded not so much on the stern realities of self-preservation as on ideals of cheerfulness, willingness and enthusiasm—the three stepping-stones to high morale in the modern Royal Air Force.

Yet, unless he is a forgetful man, he remembers the atmosphere of his training unit. On the whole, he remembers, it was a cheerful atmosphere, and what discipline there was seemed to put an edge on life. Then, it seemed, he was treated more as his father, who was a soldier in the First World War, said that he was treated. At the same time he remembers that, although he was all the time learning things, life seemed uncomplicated. He did what he was told, and there was very little more to it than that. Now, he does what he is told; but there is this difference, that he is freer to work out his own ways of doing it. In other words his initiative has freer play.

The difference between the atmosphere of a training and an operational unit is one which becomes apparent to almost every serving member of the Royal Air Force, officer or airman. It is a modern instance of the difference between the old and the new tradition of discipline.

Between what is practical and what is the ideal there may be a great difference. What is practical has stood the test of experience, and experience, may form the sounder basis for future ideas.

Restoring the Balance

What, then, are the practical lessons of the past which may help us in the future to answer the problem of restoring a balance between a too idealistic and a too uncompromising approach to the problem of maintaining discipline? Typical examples of what may be achieved with high morale, but by differing methods, are provided by the exploits of the British Fighting Services and the British civilians in the late war. Both Service men and civilians were subjected to experiences against which a low state of morale could not have prevailed. Yet though the discipline of the Services and the discipline of the people had much in common, there were important differences. The one was founded on discipline by force in the form of fear of punishment, the other upon discipline by persuasion. The origins of these two types of discipline are interesting. The discipline of the factory worker, to take but one example, which kept him at his work-bench when bombs were falling and which made him cheerfully endure a degree of suffering and hardship such as had never been visited upon British people, was based not upon military traditions so much as upon a code of ethics as difficult to describe in abstract terms as morale itself.

The enforcement of such a code did not, however, depend wholly upon true altruism. While the serving man was ordered to his task which he was paid no more for doing than in times of peace, the civilian was often persuaded to his by the inducement of higher wages. It was inevitable that very often a different concept of duty was born in the mind of the civilian.

This changed concept can prove incompatible with authority itself. A modern instance of this is to be found in the embarrassment of the Coal Board in their efforts to establish discipline in the mines. Since the Board took control they have met the miners in, as some have thought, an excessively conciliatory spirit, both locally and nationally, presumably in the thought of bringing about a better relationship in the pits. Now, the nation is told, the "honeymoon period" is over. Increased stints will be enforced where they are reasonable, penalties will be imposed on absentees and conditions may even be attached to the paying of the minimum wage.

Industry has demonstrated that persuasion is a stimulant which loses its own effect. The dosage had to be increased. Not only have wages had to be increased, but "conditions" have had to be improved. Inevitably there has been a direct reaction upon the serving man. He, too, began to expect higher wages, not only to keep level with the factory worker but in order to offset the rising cost of living. He, too, began to expect better conditions. Without the promise of these things he would no longer join the

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Services in peacetime. Such ideas implied sentiments which directly opposed military traditions, even the more pliant, more compromising form of it in the Royal Air Force. The power of persuasion and all that is implicit in persuasion, such as the importance of the individual or a particular group of individuals and the feeling that if Jack is not as good as his master he is very nearly so, threatens to upset the old forces by which morale in the Royal Air Force, no less than the other Services, was held in equilibrium. The morale of the factory worker or of the miner, that is, morale defined as "cheerfulness, willingness and enthusiasm," is, under the present system of persuasion patently at a low ebb. Nevertheless, there are no grounds for contending that persuasion is in itself responsible for such a state of affairs. It may be that any system of government or of discipline which tends to increase the importance of the individual or the group at the expense of the people produces a detrimental effect on the morale of the people itself. The effects of such a lowering in morale in industry are more clearly recognized in the now well-known symptoms of industrial unrest and dissatisfaction. Such effects in a Service may be evinced in a falling-off of the quality known as Pride of Service.

It has long been recognized that discipline has an important part to play in the inculcation of pride of service. The incentive of war to a large measure supplants the need for orthodox discipline; in conditions of active service there is abundant opportunity for discipline by example. Thus, the self-imposed discipline of courage, whether in the individual or in the group, may prove more effective than all the regimens of "barrack square" orthodoxy. For example, it is well known that the morale of groundcrew rises in proportion to the successes of the pilots whose aircraft they tend. In general, Pride of Service is marked in war. In peace it has shown a tendency to fall off. But the peace years must be the formative years for any Service, for the great majority of professional fighting men receive their training, not under conditions of active service, but in conditions under which incentive must be produced within the Service itself.

Conclusion

There are good reasons why the Royal Air Force has already broken with the older, more orthodox tradition of discipline imposed by force in the form of fear of punishment rather than by persuasion. The question which now remains is whether the break has not been so violent as to result in a reaction to a discipline which is founded too much on persuasion and is subject to all the pitfalls of such a method, such as a detrimental effect on morale. Further, it is necessary that whatever will be the essential character of the Royal Air Force discipline, it must be consistent with a tradition formed by the Service for the needs of the Service. Inconsistencies such as training upon orthodox military lines of discipline and a regime of leniency in operational units can only cause confusion in the minds of airmen. In the past, and in particular during the late war, the high morale of any British fighting service has been taken for granted. Now that, in peace, the very foundations upon which that morale was based have been shifted in accordance with a nation-wide change in men's ideas of discipline, it would be unwise to take high morale for granted. Now is the time to take lessons from industry. Thence much that is good and much that is bad may be learned; but the blending of contemporary ideas with those of tradition must be subtly done. It would be bad for the prestige of the Royal Air Force and for the morale of its personnel if it became apparent that morale depended upon a brand of discipline that changed with the political hour. Tradition, to mean anything, must have at least the outward show of permanency.

Above all, it must be shaped by men who have not lost the power of believing in themselves and who do not, in the modern spirit which regards change as being synonymous with enlightenment, allow themselves to be led too easily from old ideas.

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Maintenance of Aim

By B. J. Hurren

THE slightly salacious story of the Father Flea who took his young son to the zoo to see the elephant and demonstrated by means of that noble beast a profound business truth, can be adapted after study of some German efforts to the effect that the greater the organization the bigger the cannon balls.

This sagacious remark is pointed by the information now available concerning some of the cropheads' efforts in the gun line. Details have been released of a mighty gun, "Heavy Gustav," which fired a shell of unequalled size and give. Incidentally, its code name whilst under secret construction was "Dora," though whether this was a compliment to some backroom mistress or a delightful play on the British term D.O.R.A. is not disclosed.

Krupps, foremost among cropheads, built Schwere Gustav. We can, quickly, off-load the salient features of this triumph of German *kultur*. It weighed 1,500 tons and had a very long barrel. It could fire a 7½-ton shell to a maximum range of twenty-eight miles. Its calibre was 80 cm. (31.496 inches).

Two of these were built: one was used at Sebastopol in 1941 and the second, not used, was intended for hotting up Leningrad.

From these bare particulars many interesting points arise. We know that it is a principle of war that the aim should be maintained, and with Hitler's cohorts on our doorstep at Calais, twenty-one miles distant, why was the monster not used to pockmark Britain?

The technical answer is that as a gun it was only a partial triumph. It took three weeks to erect, and the daily bang was no more than *three* shells. The life of the barrel was no more than 100 shells.

That said, we now move into the realms of *opera bouffe* when we report that the gun was commanded by a major-general who had 1,500 troops on the job.

Whilst there are ten thousand examples of Hun obtuseness, it would be difficult to find one example more crassly stupid than this effort. It must be presumed that the gun was built to the orders of, and with the approval of, the German General Staff, since only the staff could appoint a major-general to command and since credulity would be too far stretched to believe this to be a private venture by Krupps.

You will note that the gun was designed in 1937, a few months in advance of Hitler's first major step of aggression, at a time when his air force had no numerical equal in the world. What sort of a Staff was it that permitted this folly? What sort of a result was expected from a 7½-ton shell three times a day—a kind of explosive dose before or after meals—compared with the concentrated results of a piloted bomber attack? Truly, the greater the organization the bigger the cannon balls!

But this leads us to enquire whether the German staff were not *en bloc* the biggest collection of military idiots in history (to borrow Hitler's epic phrase against the English). Let us concentrate on a few interesting figures which destroy for all time the myth of German organization and planning.

The Huns thought they were on to a good thing with the robot bombs, V.1, V.2 and other little boxes of tricks up to (I think) V.7. Whilst we moved rapidly ahead in orthodox air power, and whilst the enemy saw that indeterminate quality of air supremacy wrested from them week by week as our factories went into high gear and the R.A.F. was trained up to a scale never equalled elsewhere in the world (I wonder if it is yet realized that the R.A.F. is the only force to stage a thousand-bomber raid?), the Thuringian thugs and the Saxon subnorms were rubbing their hands with gloating glee at the success—unsecured but surely so certain—of robot war.

The clash in appreciation of the true situation could not be more acute. The British "idiots" were hammering Germany to pulp, piecemeal, but the German "experts" were building sand castles on some future success, some future winner, whose form was as unpredictable as a racecourse favourite.

The cold statistics of reality still fail to convince the lumbering Teuton. Scarcely a week goes by without evidence of their blind faith—though a purist will assert that faith must be blind, or else it would not be faith but knowledge. Still in a slight but unmistakable trickle comes the phrase of magic promise: "If only we had had more time, we should have rained thousands of V.1s. on London each day. . . ." is a sample of the dope hawked around by even our own high officers who have fallen under the spell of Fritzy Frightfulness and Boche Bogy-Bogy.

In this country, unquestionably, the Whitehall Warriors were rudely shaken by the V.1, and,

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to a less degree, by the V.2. Yet, inefficient as these were compared with a quite ordinary R.A.F. raid, even they are far superior to the incredible Heavy Gustav.

The decision confronting us in war, and still undetermined, is whether to build aircraft or pilotless missiles. Here are pointers to the answer.

The robot aircraft is 100 per cent. loss after discharge: the piloted aircraft may be used again and again. One set of statistics officially available describes the average "life" of a fighter aircraft as seven months, and of a bomber ten months—but these figures do not stipulate how many missions each aircraft fulfilled on average in those months. Nor can this be fairly done, since the same aircraft operating in the front of the attack zone may have a very short life whilst in other spheres it may have a life of many years. The average "life" is interesting only to the procurement side of the aircraft industry: to a far lesser degree does it affect the operational commanders.

Almost *ad nauseam* we know what aircraft bombing accomplished, but very little is generally known of the robot bombing. It is therefore of historical interest to record the figures compiled at the receiving end of the attacks.

(But note that no sensible figures are available or even able to be compiled of the destructive effect on property and, consequently, of the dislocation of industry that resulted. Nor is there any mention of that imponderable, the psychological effect on the population.)

Here then are the summarized, consolidated, bare and yet highly revealing figures.

The V.1 or Flying Bomb

A total of 9,250 fired. Of these, only 5,950 actually crossed the British coast. In other words, just over one-third of the V.1 attack against England was utterly useless, except that some bomber, fighter and A.A. defence effort was expended.

The 5,950 which crossed the coast killed 6,250 people. Admittedly the object was not necessarily to kill people; at the same time the rate of one flying bomb to kill one person seems nonsensical. If the R.A.F. dropped nearly six thousand tons of bombs far greater results might well be expected.

Now note these facts: despite the absence of any form of personal risk to the launcher in this robot warfare, only 9,250 flying bombs were launched altogether. Approximately 8,000 of these were fired between 22nd June and 31st August, 1944; approximately 1,000 in the months 1st September, 1944, to 18th January, 1945. Against this, in 1944 the R.A.F. in Bomber Command alone dropped 500,000 tons of bombs. In August, 1944, when the flying bombs were going strong, Bomber Command dropped *in one week sixteen times as much* as the enemy fired in V.1s in two and a half months!

There is no need here to bring in figures *re* the U.S.A.A.F. and of other R.A.F. Commands. Bomber Command alone swamps the German story.

We now come to the V.2, long-range rocket bomb. This had a warhead of approximately twice that of the V.1. From 14th September, 1944, to 29th March, 1945, a total of 1,063 rockets was fired, resulting in the death of 2,758 people. One rocket, with all its intricate mechanism, to kill only three people! One thousand tons of rockets fired in seven months, whereas during the lowest *week* in the same period the R.A.F. dropped 36,000 tons (in January, 1945, when the weather was bad). The average per month, all by Bomber Command exclusively, was approximately 45,000 tons. Bomber Command's attacks were cumulatively many hundreds of times that of the V.2 effort.

How was it that the Germans, arch-priests of war since Roman times, apostles of war efficiency and planning, made such an enormous mistake in their calculations? Easy to blame Hitler, but until scientific proof of efficiency was laid before Hitler even he could not guess whether to support or contradict the German General Staff.

Why did the Germans make this mistake? Why were they so incredibly stupid as to think—as their insidious publicity now asserts—that a further series of raids on London would do anything more than the previous series did?

It is extremely difficult to follow any line of logical reasoning in their attacks—but then, even in the first attacks they made so many outstanding mistakes that one wonders where on earth their reputation for efficiency comes from.

I can, for instance, cite an area where a major British aircraft works and a major British radar factory lie alongside each other, with all-important communication lines a stone's-throw away. The only attack on this prize area was one 250-lb. bomb dropped (we believe) by accident on a paint store far from any vital machinery.

(We may compare this with the attack by British aircraft with the Fleet, at Palembang, Sumatra, where the one vital refinery section was completely destroyed in one rocket attack, and the rest of the area ignored.)

Was the German decision the false reasoning of cheapness in production—for unquestionably both the V.1 and the V.2 were cheaper than aircraft? Was it a question of speed in production

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—for, once again, the robot weapon must be quicker?

These things are veiled, probably for ever, from our questing eyes. The decisions that prompted the German General Staff were bad decisions; as bad as Goering's boast that Germany would never be bombed.

It seems to me that the salient point of the whole matter is not the technical efficiency of the weapon, nor even the question—at this stage—of robot versus piloted aircraft.

The real question is employment of the weapon, which is another way of phrasing the principle of war described in the text-books as "Economy of Force."

Apropos this angle of the subject, half the German General Staff, led by Rommel, ought to be turning in their graves if they realize now that one or two well-aimed bombs could have altered the whole story of Alamein. For, as with so many Army officers, they forgot one little thing which was the linch-pin to the whole supply system—a thing which we, bred to the sea, realized full well but apparently the great Teutonic minds could not grasp. Nothing will induce me to commit this to print for others to learn: suffice it that I will stake my reputation that one 500-lb. bomb accurately placed could have fixed the whole story of Alamein differently.

How should the Germans have behaved with their robot weapons? Clearly, the thing they had most at stake was defeat of any invasion of the Continent. They have themselves admitted as much: they have gone farther and admitted that the Allies might have landed in Northern France or in Norway and they did not know which would come up.

Simple calculations should have showed that, in either case, a formidable company of ships, large and small, would be required: that these ships would probably be assembled at dispersed points: and that they would surely have to be concentrated at the invasion point.

The Germans decided against Northern France since they could not see any possible landing port. It never occurred to them that the British, a nation of seafarers, would circumvent this obstacle. The brilliant stroke of the Mulberry Harbour was a pile of sand in the automatic and closely trammelled brain of the German military machine.

But it is the duty of the Staff to think of everything. The Germans might have argued: Suppose the British did think of establishing a port for invasion? Then, clearly, the best way of defeating that invasion would be to concentrate every available weapon against that port.

Therefore, if the German Staff had had the horse sense to make the V.1 and the V.2 mobile, "At Readiness" to concentrate against the invasion force, it is my submission that the Normandy landings could have been an entirely different story. What should we have done without the Mulberry Harbour?

But instead they did not adhere to the principle of "maintenance of aim"; they chose to mis-employ these robot weapons against mainly a civil population already inured to attack.

This emphasizes the point to be made, that there must be realist thinking concerning automatic weapons, and, for that matter, any weapon. In parenthesis, the amount of plain nonsense talked about the atom bomb is quite extraordinary.

Currently, the Americans have produced and announced a radio-controlled guided missile; and the Fairey Aviation Company has likewise a robot missile which can be steered on to a target. With this weapon, the story of Monte Cassino could have been entirely different. With this weapon, the story of any defence line could have been completely reversed, since the line of attack could be varied from front to flank or even from behind! With this weapon, U-boats attacking convoys could have given an entirely different story and kept safely out of range of counter-attack. Other applications are legion.

The charge is made, and touched on in the opening paragraphs of this article, that such robot weapons are costly because they are 100 per cent. expendable. But so is the torpedo which, in sea warfare, has again shown itself as the deadliest of all weapons.

An oft-used argument is that the guided missile can do nothing that the gun cannot do. This is a fair comment, but can be shown to be inaccurate.

First, the guided missile can carry an infinitely greater warhead than any gun—even Schwere Gustav itself—can fire in the shape of a shell. If, for example, a warhead of twenty tons is needed, then it is a simple matter to calculate the wing span required to lift such a load and the amount of propulsive charge needed to propel it through the air for a short period. No gun could approach such an attack.

Therefore, even were it much more costly to produce a 20-ton guided missile than a big shell and its major-general, etc., if the results obtained were commensurate with the effort expended, and if they could only be obtained by such an effort, then the "cheap" gun would be valueless compared with the costly robot weapon.

But is the gun so very cheap? Proponents of the gun glibly argue that a shell costs something of the order of £5 to £10, and that no guided

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missile could possibly be produced as cheaply as that.

But the cost of a shell is not merely £5 to £10. It requires a gun, a gun crew, and, above all, the cost of training that gun crew.

We thus see that the picture alters entirely. The gun itself costs many thousands of pounds. The long training of a gunnery officer and the gun crew runs not only into thousands of pounds before they fire one shell, but continues as a running drain on the armaments budget in peace and in war.

With push-button warfare the story is far different. It requires as much training to operate even the present, announced, guided missiles as it takes to operate a "Dodg'em" motor car in a circus. A little simple arithmetic will show the enormous disparity between the true cost of firing a guided missile and a shell, with the resultant overwhelmingly in favour of the missile.

But there is another aspect of this matter. Let us draw on British War Cabinet statistics. Of the 5,950 V.1 flying bombs which crossed the British coast about 2,100 were shot down by fighters before arriving over their objective, and about 2,200 were brought down by anti-aircraft guns, mainly firing shells with proximity fuses. About 150 were accounted for by protective balloons. Thus some two-thirds of the effective attack force was intercepted and destroyed before reaching its objective.

This was because the flying bombs flew on a pre-set constant course at a constant height, with a varying and increasing speed due to lightening of load as fuel was consumed.

Much the same applies to a manned bomber when it is on its aiming run. It cannot "jink" and remain a precision bomber.

The Guided Missile, on the contrary, can jink right up to the moment of impact. This is an important factor, as can readily be shown.

When a gun is fired at an aircraft, the flight of the shell takes x seconds. Supposing at the instant of firing the gunnery officer has achieved the almost impossible by getting range, height, speed and track of the aircraft exactly right, and has his instruments set so that the time of flight of the shell will allow it to arrive exactly at the point where the aircraft will be x seconds later, then there is still nothing which can alter the line of flight of that shell after it has left the gun—and there is still also nothing to prevent the aircraft altering range, height, speed and track, separately or collectively, during that interval of x seconds.

With the guided missile entirely different conditions apply. It has left its firing ramp and is rocketing skywards. Perhaps the hostile aircraft, solo or in formation, sees it approaching and jinks to avoid the menace, in exactly the same way as he would if he saw flashes from a gun battery below. But that avoiding action will avail nothing for, even if the missile overshoots, its controller can bring it back for further runs at the objective.

This seems a powerful argument in favour of the missile, but it is necessary to add a note of warning. Present missiles have disadvantages which experts know of and which, doubtless, are either in process of being overcome or else have already been overcome. The one clear point is that they can alter the whole concept of both defence and attack, and that the gun could become as completely obsolete in a modernized army, navy or air force as the horse, the sail and the biplane.

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Education in the Air Age

IN May this year a letter was received at the Air Ministry, addressed to the Under-Secretary of State, from the headmaster of a school in Lancashire, in the following terms:

> "The senior boys of this school are keenly interested in the development of aeroplanes. I should esteem it a great favour, therefore, if you would help to cultivate this interest.
>
> "These boys would greatly appreciate photographs of various types of planes, their intention being to display them prominently throughout the school.
>
> "Can you possibly help these scholars, some of whom intend to be pilots in the future?"

This very reasonable request from an enterprising headmaster was granted. A selection of photographs is being sent to him, and one of the R.A.F.'s liaison officers has been instructed to call upon him, with the permission of the local education authority, to help and advise him in his project.

But the matter does not end there. Other similar requests have been received from time to time, more particularly for redundant aircraft components, engines and engine parts, navigational instruments and handbooks. These requests are significant. They indicate that the schools of the United Kingdom are alive to the need for education in aeronautical matters. They indicate the recognition that this specialized education is necessary in order to equip boys and girls, both mentally and psychologically, for the parts they must play in the modern world. And they indicate an interest in the immediate present and a reaching forward into the future that have not always been prominent features of our educational practice.

Air-Minded Youth

In the eighteenth and some former centuries, education tended to be static. It was sufficient if pupils learnt from the experiences of their forebears; for there was little change in the way of life from generation to generation; what development there was took place slowly and almost imperceptibly. But the industrial revolution, with its sudden and rapid development of power-driven machinery and its ever-increasing speed of movement, due first to the steam locomotive and later to the motor car, revealed the necessity for schools to keep pace with the times. Even during the nineteenth century, technology was but slowly introduced into the curriculum; and the humanities, wedded to the classical tradition, put up a stiff fight against modernization, forgetting that the classics were themselves ultra-modern when they were first studied.

With the introduction and development of aviation and its incalculable effects on the social life of all the peoples of the world, this need for education for a new age has become imperative. The youth of today must be taught at school, not only the rudiments of physical science as they apply to machines, to the production and transmission of power, and, above all, to the behaviour of aircraft, they must also be made acquainted with the new social order now being rapidly established as a result of the use of aircraft, which have brought all parts of the world to within a few days' flying time of each other, and of the release of atomic energy by nuclear fission. Hence the letter with which this article opened.

It will also be noticed that the initiative appears to have come from the pupils themselves, which is also symptomatic. The youth of today is air-minded. It demands information about all things connected with aviation; and they are wise who, like the writer of that letter, do what they can to satisfy the demand. Experienced teachers will agree how pleasant and comparatively easy teaching becomes when the "desire to learn" is present.

Air Affairs

At about the same time as the letter from Lancashire was received, our attention was drawn to an international quarterly published in America and entitled *Air Affairs*. This excellent publication devotes the whole of one issue (Volume 2, No. 2, Winter, 1948), to the subject of "Education in the Air Age"; and it contains sixteen articles specially written for it—mainly by educationalists but also by men experienced in industry and in the operating of air lines on a world-wide scale. The Americans are nothing if not progressive. But even they have sometimes lagged behind; for, as one of them says, if education in America had kept pace with the development of automobiles in the early part of this century as it is now keeping pace with the development of aviation, "it is quite unlikely that 35,000 Americans would have been killed by automobiles in 1946."

The same may be said for education in Britain. If we have allowed the developments in our mechanized industries and in our transport to outdistance our appreciation of their social

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effects, we may now, at least, ensure that education in the air age keeps pace with developments in aviation, so that the rising generation, which is far more ready to learn than its parents, may, in due course, enter upon its adult duties fully equipped and already aware of the problems waiting to be solved.

The First Problem

The first problem, according to Mr. Paul R. Hanna, who writes the Introduction, is to decide whether we shall educate for war or for peace. There are apparently three schools of thought. Some consider that "modern war is so destructive that peace must be maintained at any price"; others "hold that peace is not possible in our time," and these would "turn education at once to the specific task of preparing the body, mind and spirit of youth to hate and to fight an enemy." But the majority of teachers, he says, have not accepted either of these propositions; these "view the struggle between democracy and communism as real and significant, but they do not believe the contest must inevitably lead to war." They therefore teach "the necessity for attaining world peace through democratic world organization" and the need for "sufficient military power to discourage any potential aggressor."

Mr. Hanna finds himself among the majority, and he sums up the situation in eight theses, as follows:

"1. Modern science and technology applied to world-wide communication and transportation have brought two billion humans mechanically into a world community.

"2. This mechanical one-world community cannot survive for long without institutions, particularly governmental, that are correspondingly one-world in scope and in sovereignty.

"3. These world-wide institutions, and again, particularly governmental, must be representative and democratic or the new technology may be used to enslave man permanently at a time when he faces his first real freedom from fear, want and oppression.

"4. One-world government seems for the moment to be thwarted because one great power contends that the one-world government be authoritarian and communistic, while certain other great powers insist that a representative and democratic pattern must prevail.

"5. What actually exists now, and is likely to continue until one or the other of the conflicting ideologies wins a clear victory, is two worlds instead of one.

"6. Over a period of time the probable behaviour of a split-world community is an atomic-bacterial war that may destroy civilization.

"7. Those who favour representative democracy believe the chief hope for avoiding such a two-world war is (*a*) to keep the channels of world communication open in order that the story of democracy may be carried to all peoples; and (*b*) to strengthen the democratic portion of this divided world by providing all men with more of the good things of life, and a greater share of personal freedom. If this can be achieved, the authoritarian ideology must gradually lose force and validity in face of the superior performance of representative democracy.

"8. If we fail, in this 'cold' ideological conflict, to move rapidly enough, or on wide enough a front, or if the other portion of the split world resorts to aggressive 'hot' war, then our last desperate hope lies in the possession by democratic peoples of sufficiently powerful war techique to defeat any aggressor, salvage as much as we can of war-seared civilization, and then provide leadership in establishing representative democratic government for a world community."

If these theses be accepted, they "lead the educator with irresistible logic to the three great educational tasks:

"1. The schools and colleges must do everything possible to *clarify the concept of democracy*, to help any and all to understand its basic truths, and to demonstrate what life is like when squared with its principles.

"2. The schools and colleges throughout the democratic areas of the world must do everything possible to strengthen the idea of and to foster the desire for a *one-world community* with its representative democratic government.

"3. At the same time, schools and colleges must do everything necessary to build the physical, intellectual and moral strength essential to discourage any potential aggressor; but, *should there be another war*, the schools and colleges *must* have contributed to building sufficient physical power to win that war and preserve representative democracy."

Education, Aviation and Society

In an article with the above title, Mr. I. James Quillen writes: "The validity of the dictum that modern civilization is a race between education

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and catastrophe was never more apparent than it is today." Whereas "modern science and technology . . . make possible standards of living and physical well-being almost beyond the age-old dreams of man; air power plus the atom bomb hang over modern culture like the ancient sword of Damocles." Are we to apply the knowledge and power we have gained to self-destruction or to a raising of our standards of living, both physical and cultural? For mechanical inventions, by reducing drudgery, can create the circumstances in which culture develops. "Greek culture was made possible by human slavery. The machine is the modern slave."

The present tensions within and between nations, according to Mr. Quillen, are due to social maladjustments which are themselves due to the fact that sociological developments have not kept pace with scientific, economic and technological developments. Had sociology kept pace with the numerous and rapid changes that are now taking place in the material circumstances of human life, there would be far less anxiety, misery and distress; the peoples of the world, understanding what was taking place, would adapt themselves to the changes as they occur without dismay and without distress. And to complicate matters, one large group of the human race is convinced that the way of progress is along the path of communism, another would adopt a fascist type of totalitarianism, and a third (our own) is wedded to the democratic ideal.

All this points to the need, in every country, first for education adapted to the existing economic material circumstances of life in that country, including the external circumstances which affect it, and second for education in the thought and manner of life of the other great groups of nations, with a view to mutual understanding and respect and to a possible ultimate fusing and harmonization.

Education adapted to existing circumstances will be largely concerned with aviation and instantaneous electrical communication. These together "make possible a tremendous increase in the world interchange of people, things, information and ideas. They end the isolation of national political units and bring within the realm of possibility a free world community. On the other hand, air-borne atom bombs bring the possibility of the destruction of modern civilization on the establishment of a world community based on conquest, exploitation and human slavery," And the answer to the question—which is it to be?—depends on the appropriateness and efficiency of modern education. Modern education must therefore include: "(1) the nature of aviation—its promise and its dangers; (2) the effects of aviation on ways of living, especially on the economic and political interdependence of peoples; (3) the ends which aviation should serve; and (4) how aviation can be used to achieve those ends." Fortunately, the speed of air travel and electrical communication not only sets the problem but also provides facilities for its solution, by making "necessary and possible a world-wide approach to educational problems. Teachers and cultural leaders from all parts of the world can meet, develop mutual respect through direct association, consider common problems, and devise co-operative means for solving them. And the rapid and free exchange of all forms of teaching material is now easy."

Objectives of Air Age Education

Mr. Edwin A. Lee asks: "What is the role of public education in preparing youth and adults for the air age?" There are, he says, four primary objectives:

"The first objective . . . is to prepare workers for effective performance at all trades and in all aspects of what may be called the 'air industry.' " By this comprehensive term he embraces everyone who contributes in any way to the successful operation of air lines from professors of aerodynamics, metallurgists and aircraft engineers, through the constructional and maintenance staffs to the pilots, clerks and hostesses with whom the passenger normally comes into closer contact, as well as a host of others whose work behind the scenes makes flying a normal and generally safe method of transportation. And an essential part of education for the air industry is vocational guidance as well as vocational training.

His second objective is "to teach the services and values which the airplane may render to the consumer." These may be divided into passenger, freight and mail services, and each is still in its infancy. Passenger flights are profitable not only to business men to whom time is money and speed is essential, but they greatly enhance the value of a pleasure trip by reducing to a minimum the time spent *en route* to and from the place or places to be visited, thus lengthening the actual visits. Freight services by air enable perishable goods such as flowers, lobsters, fruit and vegetables to be transported thousands of miles and to be served up fresh at their destination; while "spare parts of intricate machinery can be rushed within hours to the remotest parts." And there is no need to emphasize the invaluable services of aircraft in the carriage of mail, newspapers and other printed or written matter.

"The third objective may be stated in these words: It is the function of education to exploit to the maximum the cultural and scientific potentials of the air age." If "the airplane has

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figuratively shrunk the world," it has also "made possible the expansion of the world, culturally and scientifically, not figuratively but literally. When, to the accessibility of men's minds which the radio makes possible, there is added the physical accessibility of man to man which the aeroplane makes possible, then there is disclosed a potential for world understanding and appreciation so compelling in its implications as to be almost overwhelming." This increased facility of intercourse demands, the writer says, that "educated persons shall become at least bilingual" until that far-off time when there will be one universal language.

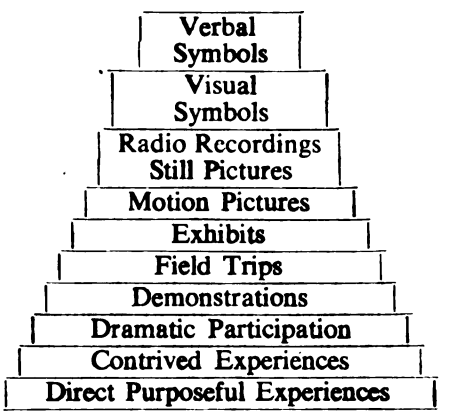
"The fourth and final objective grows out of the third. . . . It is the role of education to inculcate the ethical principles which in the air age must motivate peoples everywhere lest civilization be destroyed by the instrument our minds and hands have fashioned. . . . Atomic warfare and bacteriological warfare are creatures of the air age, too. The whole world lives in the fear that they will be waged in all their hideousness and without warning in the 'inevitable' next war. Why 'inevitable'? Because, as the preamble to the Constitution of UNESCO says, 'Wars begin in the minds of men'—and in the hearts of men as well. It is here that the impact must be made, and it must be in ethical and moral terms." Here is the proper task of education and its most sublime privilege.

The writer states his "personal belief that men alone and unaided cannot achieve the good will so essential to the preservation of world civilization. To all his high resolves and good intentions must be added the dynamic of religion, a seeking for divine guidance from Him who made heaven and earth and all that is therein. . . . How to bring the dynamic of religion into public education and escape the snares and errors which have beset past attempts will challenge the ability and leadership of our best educators, but do it we must, lest our children's children inherit another 'Dark Age.'"

Aids to Education

In an article entitled "Audio-Visual Materials," Mr. Edgar Dale examines the various aids to education and points out how "the technological revolution in the production of goods has been accompanied by a technological revolution in methods of transmission of ideas." He finds that there are, in general, three ways in which a person can learn something: (i) by overtly doing something; (ii) by observation; and (iii) by observing symbolically, i.e., by "rehearsing an action verbally through reading about it. The method of communication (of ideas) which is most difficult, most flexible and most abstract is that of the use of language. Ideas are often conveyed by signs which usually bear no resemblance whatsoever to the action or ideas for which they stand." This is so obviously true; yet it is apt to be overlooked by many who are responsible for teaching the young, and it is remarkable how much teaching is done by means of verbal symbols, either spoken or written or both. There is therefore need for as many concrete teaching aids as can be pressed into the service of education, such as motion pictures, exhibits, charts, posters, graphs, "mock-ups," and projectors throwing both transparent and opaque pictures on to a screen.

Mr. Dale illustrates "the problems involved in educational materials for an air age education by means of a 'Cone of Experience'," thus:



And he adds the following explanatory notes and comments on each of the ten methods:

"Direct Purposeful Experience

"The base of the cone represents direct reality itself as we experience it at first-hand. It is the rich, full-bodied experience that is the bedrock of all education. It is the purposeful experience that is seen, handled, tasted, felt, touched, smelled. It is the unabridged version of life itself—tangible experience which we commonly refer to as 'something you can get your fingers on,' 'something you can sink your teeth into,' etc. The possibilities for direct experience which the schools will find at the airport, at the plane factory, in the airplane, etc., are so obvious that they need no detailing here.

"Contrived Experience

"The second stage in the development of increasingly abstract experience may be illustrated by the working model. It differs from the original either in size or complexity; we simplify it by a working model. For teaching purposes, the model

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may be easier to understand than the thing it stands for.

"A contrived experience is 'editing' of reality, an editing which makes the reality easier to grasp. The 'stick' on an airplane is hard to understand when you sit in the pilot's seat and manipulate it, but a simplified model or a cutaway model shows clearly and simply how the mechanism works. For teaching purposes, therefore, the imitation is better than the reality which it imitates.

"An airplane factory sprawling over many acres may be baffling to a visitor. It is too much for the eye to take in. But a working model of that factory can make the processes much more simple to understand.

"A 'model' city presented through models often helps immensely in teaching city planning. Initially it is a better teaching method than the aimless travelling over miles of streets and viewing scores of buildings, parks and the like. The contrived experience is a much more fruitful teaching device.

"Dramatic Participation

"There are many things we cannot possibly experience at first-hand. Life is too short. Restrictions of time and place make it impossible for any of us to experience directly much of what we need to know if we are to be educated. Besides, we cannot experience directly something that has already happened. Furthermore, some matters cannot be reduced to a contrived experience, and some ideas must of necessity be somewhat abstract and symbolic.

"Dramatic participation can help us to get as close as possible to certain realities that we cannot reach at first-hand. We participate in a reconstructed experience, not the original one. We relive the struggles of the early pioneers of aviation —the Wright brothers at Kitty Hawk, or Byrd at the South Pole—by assuming the roles of these characters and their associates in a play, tableau or pageant. We re-enact a session of the United Nations General Assembly, thus getting the 'feel' of participation.

"There is a distinction between participating in a dramatization and watching it. Both experiences can be fruitful, but a person who plays a part in dramatic reconstruction gets closer to the direct experience than one who merely looks on. Thus, if we were to divide this band of our cone into two parts, 'Dramatization by participation' would be the lower one (because it is a more direct experience) and 'Dramatization by observation' would be the higher one, and less vital. The spectator is farther away from the original reality than the participants who re-live the scenes.

"The three stages that we have discussed so far all involve doing. The direct experience, the securing of contrived experience through the use of working models and mock-ups, and the experience of reconstructing reality by acting it out in a dramatization—in these three the individual is not a spectator but a participant.

"In the next five stages on the cone, the individual is an observer. He no longer participates actively with responsibility for the outcome—he merely watches.

"Demonstrations

"A demonstration is another means whereby a person can see how certain things are done. A coach demonstrates how to pass a football; a science teacher demonstrates the buoyancy of lighter-than-air gases for dirigibles; an arithmetic teacher demonstrates the use of an instrument for figuring wind drift.

"Demonstrations may require nothing more than observation on the part of the person instructed, or he may be asked to do what he has just been shown how to do. Whether the demonstration is to be followed by this 'doing' on the part of the learner depends on the nature of the teaching problem.

"Field Trips

"On a field trip we often see other people doing things. We watch them and note the meaning of their actions. As spectators, we are not responsible for what happens—we are on the sidelines, without authority or ability to alter the event. We merely watch it unfold.

"When observation is combined with participation the field trip becomes more meaningful. Such a variation of the field trip indicates again how the bands of the cone interlap and blend into one another. We are beginning to see that our cone is by no means a perfect representation of the different levels of abstraction but merely a teaching device to accent certain points.

"Exhibits

"It is not easy to place 'Exhibits' on the cone. Sometimes they consist only of working models arranged in a meaningful display. Sometimes they are a series of photographs, or of photographs mixed with models and charts. Sometimes they include a demonstration or a motion picture. We shall keep our bearings if we remember that an exhibit is essentially something one sees as a spectator. A mock-up is seen by a spectator, but the spectator also operates some of the spread-out materials, or is otherwise engaged in doing. Usually, one is not involved in handling anything or working the materials, though some complicated exhibits include such added sensory ex-

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periences. When they do, of course, the learning can become that much more meaningful.

"MOTION PICTURES

"The motion picture experience, unlike the field trip, unfolds with a compression of time and space. All the experience is not there. But this loss in directness and this compressed experience has compensating advantages. The motion picture can omit unnecessary and unimportant material and concentrate upon a few selected points.

"Motion pictures present an abstracted version of the real event, with consequent losses as well as gains. It may be easier to understand than a more direct experience. A deliberate and contrived order has been imposed on the material, different from the reality itself.

"The motion picture can also dramatize events so effectively that we feel as though we are present at the reality itself.

"RADIO RECORDINGS, STILL PICTURES

"It is hard to place radio recordings and still pictures on the cone. Placing them at this level does not mean certainly that they are hard to understand. Radio uses both words and sound, as in music. It may or may not be hard to understand, but except for 'natural sounds' it is on an abstract level. The still picture, whether shown as a photograph or as a projected film strip or a slide, has usually had the depth dimension removed. The film strip differs from both the glass slide and photograph by using photographs in a fixed order.

"VISUAL SYMBOLS: CHARTS, GRAPHS, MAPS, ETC.

"When we enter the next stage on the cone, we no longer have the realistic picture of the thing itself but an abstract representation. With charts, graphs and maps we no longer deal with literal reality but with substitutes. We communicate by means of a new language—visual symbols. A chart may use a dollar sign or a drawing of a coin to represent money, or a silhouette to symbolize one-hundred plane pilots. It may use a pie to represent $1 of federal tax money, and a slice of the pie (part of the $1) for federal expenditure on military aircraft. A graph may use a line to show growth and progress—a line which shows a rise or fall in passenger-miles flown, production of new planes, changing accident rate, and the like.

"VERBAL SYMBOLS—PINNACLE OF THE CONE

"The next and final stage brings us to verbal symbols—designations that have no resemblance to the objects or ideas for which they stand. All appearances have been removed from the original.

"Though certain spoken words are held to be imitations of the things they stand for (onomatopoetic words like whir, swish, crackle), once they are conveyed through verbal symbols transcribed on paper they have lost their last trace of direct reality. Thus, the pinnacle of the cone is not a rarefied height frequented only by the great intellects, for a child who can read and write '*airplane*' is a user of verbal symbols. Indeed, the reading-writing processes begin at the pinnacle of the cone.

"The cone of experience is a metaphor and, like all metaphors, needs careful interpretation. We cannot neatly classify all experiences the way a literal interpretation of the cone would suggest, but the writer believes that it will be helpful as we realize the enormously difficult problems of international communication."

AVIATION IN SECONDARY SCHOOLS

In considering the teaching of aviation as a "subject" in the secondary schools of America, Mr. Harold C. Hand notes with satisfaction that "as long ago as 1943 approximately one half of all American high schools were giving courses in the science of aeronautics"; but he also finds that, among fifteen schools whose curricula were the subject of a special investigation, "only one gave systematic attention to the social implications of education." And towards remedying this omission, he offers a list of topics under four heads, which he quotes from the *Aviation Education Source Book* (New York, Hastings House, 1946—850 pp.), as follows:

"*I. Understanding Modern Air Transportation:*

"Purposes for which aircraft are used.

"What big air terminals are like; services and personnel.

"What airlines are; how they operate.

"What airways are; where located; how constructed and maintained; how and by whom used.

"How scientific research is improving aviation.

"How aircraft are manufactured and distributed.

"How personnel are selected and trained.

"How airports and airlines are financed and operated.

"*II. Understanding how aviation affects the lives of people here and all over the world, and how it is making people everywhere more interdependent:*

"How the airplane has shrunken our world in time and distance.

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"How aviation influences business and industry.

"How aviation affects employment opportunities.

"How aviation influences universal units of measurement, currency and language.

"How aviation affects the movement of population.

"How aviation affects health and safety.

"How aviation affects recreation.

"How aviation affects national security and world peace.

"How aviation affects relationships between communities and nations.

"III. Understanding the governmental regulations that are essential in an air age:

"What government regulations are essential to regulate aircraft in the air and at airports?

"What regulations are essential to guarantee qualified operators?

"What provisions must be made for weather forecasting?

"What regulations should govern the manufacture of aircraft?

"What governmental controls are necessary to prevent the spread of disease by airplane?

"What international regulations are desirable?

"IV. Understanding how air transportation developed and what its future prospects may be:

"Past and recent history of aviation.

"Plans under way and contemplated concerning aviation.

"Probable working out and likely consequences of these plans."

U.S. Air Force Education

This article, contributed by Major-General Muir S. Fairchild, U.S.A.F., being full of interest for all readers of THE ROYAL AIR FORCE QUARTERLY, will be the subject of a separate review in the next number of this Journal.

Aviation Education in Europe

In three special articles, a brief summary is given of the progress made in Aviation Education in Europe, in the United States and Canada, and in certain of the Latin-American republics of South America.

It appears that in November, 1947, the representatives of "thirty-three (European) Governments met in Geneva to attempt agreement on the principles to govern international air relations. The conference was a complete failure."

There is, however, a more hopeful side to the situation: "European experience in international co-operation on air matters dates back to 1919. Between that year and 1939 the awareness of the interdependence of aviation interests steadily increased. This knowledge, which even the political antitheses could not extinguish, resulted in the creation of a just system of European air routes, about sixty of which were jointly operated.

"Another encouraging factor is the remarkable achievement of civil aviation in Western Europe after the end of the war in 1945. In 1946 the most important European air carriers sold about six times as many passenger-kilometers as they did in 1938. These results could not have been achieved by the carriers, which for the most part had to rebuild from nothing, if Europe had lost its creative ability, or if, as some want us to believe, Europe was in a process of total decline. One is justified in expecting that the educational value of the fast-growing practice of international aviation will have a favourable effect on enlarging also the mental horizon of aviation.

"At the moment there is not in Europe a deliberate attempt to develop the younger generation at elementary and/or secondary schools for the air age in a broad sense or of making the youth aware of the social implications of aviation. As to the question of what in the near future should be done in this respect, there exist two schools of thought among the official educational authorities: first, the schools should retain present methods, thereby leaving to the initiative of the teachers themselves the manner of connecting aviation to the various subjects, such as geography, history, etc.; second, educational administration should introduce 'aviation' as a special subject, thereby necessitating the institution of courses for teachers, thus enabling them to acquire a basic understanding of the general aviation problems and effects. The first school seems to be prevalent in the minds of the British educators.

"An interesting development in the second school is being made in France, where courses in twenty-three towns have been organized to give aviation instruction to some 600 teachers. Those finishing the course receive a 'certificat d'aptitude à l'enseignement aëronautique.' Also, in the Netherlands, steps are being taken to insert 'aviation' as a subject in the educational system and to prepare courses of instruction for the teachers. It certainly is to be expected that these examples will be followed in other European countries.

"Leaving the instruction as regards general aviation questions to the unco-ordinated initiative of the teachers themselves will not produce the desired result. What does the average teacher hear or know of the problems of aviation and society? And, if he does hear, how can he

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analyse, discuss and teach such matters without some previous guidance?

"In the specialistic field, in the field of education directly concerned with actual flying, great efforts are presently being made in Europe. As a first step to introduce young boys to practical aviation and to instil in them an interest themselves to the study of technical questions, much emphasis is given to aero-modelling. In Great Britain and Sweden, for example, there are now more than 350 model aircraft clubs counting many thousands of members. And steps are being taken to introduce the subject in the handicraft curriculum of various schools.

"Much encouragement also is being given to gliding activities which is one of the best means of obtaining air experience and is therefore considered an integral part of aviation training. In France, the Netherlands and Sweden subsidies are granted by the Governments to national aeroclubs, charging them with the organization of gliding instruction. In Great Britain, following a report on private flying of a Special Advisory Committee to the Minister of Civil Aviation, it is to be expected that financial aid will soon be given to gliding clubs.

"The situation for light aeroplane flying is less favourable, for here the general lack of financial resources is strongly felt. After World War I, financial aid was given to flying clubs to develop civilian flying training and to encourage the practice of flying by the general public without imposing thereon any liability for military service. With the growing international tension of the 1930's, the defence value of pilots trained on light aircraft was stressed more and more, and increases of financial assistance were made for consideration of a military nature. After the end of World War II, subsidies for private flying were either not renewed, or only to a limited extent. But the consequence of this limited Government aid, from both the civil and military points of view, is now being realized, and it is to be expected that various Governments again will try to encourage private flying as much as is in their power.

"The training of civilian pilots for the airlines presently starts with military air training. After receiving his military licence, the prospective airline pilot gets further training either by a special civil flying school or by the air carriers themselves. Important advances have been made in the field of engineering and technical aeronautical training, and many new colleges for this higher trade training have been created in various European countries.

"When considering the prevalence and power of the demand for such specialistic aviation training as well as the strong tendency to lay a practically exclusive emphasis on the specific and immediate in aviation, the urgent need for a general education in air matters at once becomes extremely apparent. The future of an enlightened education for the air age depends in the first and last instance on the possibilities of change in the method of thinking of those in possession of the actual facts. Such a change is a prerequisite to agreement on the broad and constructive principles which will protect and promote the unifying element in aviation.

"An important contribution to the arrangement of such a change in thought can and should be made by the universities. A start along this path already has been made by certain European universities: the goals and values of aviation in social relationships, in economic life, and in the political structure of the world, are being analysed and discussed. Special Chairs of Air Law have been created at Leyden University and at the University of Aix-en-Provence. At the Universities of Paris, Cambridge, Zurich, Lausanne, Geneva, Rome, Naples (and others, possibly) regular courses in air law and related subjects are being offered.

"Intensified contacts leading to regular exchanges of views between those who are studying the broader implications of aviation most certainly will lead to a deeper appreciation of that which is of enduring and vital significance as well as contribute to the acceptance of common standards based on a union of knowledge and reason. As Sir George Cayley wrote in 1809, 'an uninterrupted navigable ocean that reaches to the threshold of every man's door ought not to be neglected as a source of human gratification and advantage.' "

North and South America

In the United States, it appears, the aircraft construction industry and the airline operating companies provide valuable factual material to schools and colleges for use in aviation education, being advised, as to the kind and form of the material required, by expert educators.

"In June, 1939, an event occurred which terminated the normal rate of adjustment by the schools to the demands of the emerging air age. This was the passage of the Civil Pilot Training Act of 1939. This Act was concerned only with the pilot training aspect of aviation education. It provided for instruction, both in flight and in such related subjects as navigation, meteorology, power plants, aircraft structures, and aerodynamics. The act initiated the most extensive and comprehensive civil pilot training programme ever to be conducted by any nation. Without doubt it was designed to meet an anticipated emergency by creating a supply of pilots and de-

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veloping some general understanding of the nature of aviation. Since Germany had previously undertaken mass pilot training through the medium of gliders, it was also in part an answer to her challenge for air supremacy. That it succeeded is borne out by the facts that 10,000 light plane pilots were trained during the first year, that long before the Pearl Harbour attack its graduates were enlisting in the Army Air Forces at the rate of 1,000 per month, that 75 per cent. of the Royal Air Force's Eagle Squadron were its graduates, and that thousands of its graduates won military distinction during World War II. In so far as the public schools were concerned, this programme directed attention to the ground school aspects of pilot training instruction. This emphasis on aviation education was to prevail particularly in the colleges until the spring of 1944. It was only after students became convinced that the opportunities for careers as military pilots were doubtful that interest on the part of public schools and colleges in the general educational and cultural possibilities of aviation took an upward trend.

"AIR EDUCATION DURING THE WAR YEARS

"When war was declared on Germany, the Civil Pilot Training Programme had already provided pilot training for approximately 97,500 young men. The programme, which had been somewhat curtailed in the fiscal year 1942, was tripled in fiscal 1943. During its existence, the programme trained almost half a million men. Beginning its experimental year with 13 colleges and 331 students, at its peak development it contracted with 884 colleges, 268 private schools, 195 high schools, 120 civic organizations, and 1,250 flight instruction contractors. During 1942 experimental flight instruction programmes were conducted in 22 high schools; 217 pilots were trained in this programme. The training was achieved without accident and the students were apt at developing essential flight skills.

"It was a parallel development, however, which set the pattern and determined the trend of aviation education in the high schools during the war years and came to define the type of service the Civil Aeronautics Administration was to make available not only to high schools but also to elementary schools and colleges. The general consensus was that high school boys lacked the necessary maturity to exercise the judgment demanded of military pilots. Evidence had built up which supported the belief that although high school boys could readily acquire flight skills, other essential understandings pertaining to navigation, bad weather flying, and flight rules and regulations for use under operational conditions were too difficult for such age groups to master. It was agreed, however, that a preparatory course in these so-called ground subjects might well be offered to high school students as preparatory courses are offered to them in other fields to be mastered subsequently during the college years. This was to be introductory in nature. It came to be designated the Science of Pre-Flight Aeronautics or simply Pre-Flight Aeronautics. . . .

"In the fall of 1945 there were some school administrators who had regarded aviation education not in the light of those who pioneered the movement but from the point of view of its value to the war effort. Fortunately, there were many more leaders in education who were determined to keep education abreast of the air age, and who recognized the value of aviation education in any programme of security that the democratic nations might adopt. Consequently, many secondary schools continued to offer a course in the science of aeronautics. Others dropped this course or correlated some of its content with other science courses.

"Important interests, however, continued to work on behalf of aviation education. In both the United States and Canada, military authorities recognized the need for a number of young men trained as pilots, adequate to meet the military and the commercial demands for airmen. The value of this aspect of aviation education is obvious. . . .

"The problems of aviation education vary, depending upon the objectives of the educational institutions concerned. At the college level, in the professional school, they relate to producing the best possible aeronautical engineer or airport administrator. At the junior college or commercial school level they bear upon the best possible training for pilot, mechanic, or the student who has chosen as his career any one of the many jobs available in aviation. At the public school level they are concerned with different matters.

"There is still, on the part of the average layman, some lack of understanding of the nature of the influence of aviation upon his way of life. The average man finds it difficult to believe that the aircraft, because of the speed with which it travels and its lack of respect for natural and artificial barriers to social intercourse, has confronted us with many problems concerning human relationships and national relationships. There are still some school administrators labouring under the weight of tradition who are wearied by thought of the curricula changes demanded now that a new medium of transportation has been developed. Such individuals need all the assistance and guidance that the vigour of the air education crusader can devise."

"The great needs, however, are at present the

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ones that confronted aviation education in the 1920's when those with prophetic vision conceived the need for a new education for a new world. Teacher training institutions must provide both pre-Service training and in-Service training. On the one hand, this training must be provided for the classroom teachers. It should be general in nature, stressing the changes suffered by traditional institutions because of the aircraft's advent, and guiding them in the use of pertinent current events in their teaching. On the other hand, programmes of studies must be set up for those who would teach the science of aeronautics. We should never lose sight of the fact that national security now demands both an understanding of the changed relations of the nations engendered by the aircraft and youth skilled in the sciences of design and operation of aircraft.

"The remaining problem has to do with the production of the materials of instruction. In this respect, there are still many gaps that need yet to be filled. Without doubt, as time goes on, this need will be met.

"Aviation education, like aviation itself, is here to stay. Except for the special courses and the vocational and professional programmes of study, it amounts to keeping the educational practices of the school paralleling current events in their social effect and influence. The problem of aviation education becomes, then, in part, the problem of general education.

"Since there is an admitted gap between school and society, it is doubtful that 'aviation education' will completely succeed in attaining its objectives. However, there is current a realization on the part of the schools that there are many agencies ready to co-operate in the service of education which can be used to close this 'traditional' gap. It would appear that such use is growing. And it is desirable that the efforts of all such agencies, governmental and industrial, all representing the numerous aspects of our complex society, be co-ordinated to this end."

As might be expected, aviation education in Latin-America varies greatly with the cultural average of the individual states. "In fifteen of the twenty republics illiteracy reaches 82 per cent. and only south of the twenty-second parallel does the figure descend to 20 per cent."

Argentina, Brazil and Chile are considerably in advance of the other republics. Aviation in Argentina has expanded remarkably during the past two years, and with it there has been a corresponding development in aviation education. In Brazil "the development of an aeronautical conscience has today the form of a philosophy. Aware of the fact that its destiny is ultimately associated with aviation, Brazil is making truly an enormous effort to keep pace with the air age." And Chile's preoccupation with Air Transport is easily explained by that country's unique geography—a narrow strip of land "wedged in between the Pacific Ocean and the Andes Cordillera." In these circumstances, a regular air service up and down the coast, linking all the principal cities and towns, is both easy to run and an invaluable advantage to the population, who are becoming perfectly familiar with this method of transport and communication and its social implications.

* * *

There has been no space in this review to quote from all the articles in this number of *Air Affairs*. Those not hitherto mentioned are "Aviation in Elementary Schools," and "in Colleges and Universities," "Technical and Technical-Vocational Education," and "Industry and Education." These articles are full of interest to educationalists but not for the great majority of our readers. But what has been quoted above will provide food for thought and discussion for all ranks.

Finally, there are many ways in which the development of aviation affects, or should affect, education apart from direct instruction in aeronautical science, in the operation of airlines and in the social effects of aviation. These include: (1) the need for more language teaching; (2) the need for using the globe, instead of flat maps, in teaching geography; (3) the need for more study of social anthropology; and (4) the need for more study of the customs and psychologies of other peoples. And, to quote Mr. Leslie A. Bryan: "Aviation is a new force in the world. Education is an old force in the world. Somehow and quickly, we must join these two forces if the blessings of peace and progress are to be ours in the days to come."

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The R.A.F. & Empire Air Forces

QUARTERLY NOTES

DISTINGUISHING BADGES TO GO

SEVERAL distinguishing badges in the Air Force will no longer be worn after 1st June, following a review of the whole position. Those abolished are the education officer's collar badge, bomb disposal and air/sea rescue service arm badges, and all badges showing country of origin except the "Poland" shoulder badge for the R.A.F. Polish Resettlement Corps.

The principle is to discard badges unless they are of specific value to the Service. No further Pathfinder badges may be issued, but those awarded may still be worn.

R.A.F. COURIER SERVICE PRAISED

No. 88 Squadron

A high tribute to the work of No. 88 Squadron, Royal Air Force, in maintaining a courier service between Hong Kong and Iwakuni, Japan, was paid by Lieut.-General H. H. Robertson, Commander-in-Chief, British Commonwealth Occupation Forces, when the squadron handed over the task to the civilian operators.

The squadron has operated this route for more than two years, flying a total of 680,000 miles. Some 2,600 passengers, 230,000 lb. of mail and 155,000 lb. of freight have been carried. The service was started with Dakotas, but for the greater period, Sunderland flying boats were used. Not a single aircraft was lost. The squadron will now revert to its normal task of maritime reconnaissance.

General Robertson's message to the A.O.C., R.A.F., Hong Kong, read: "On the completion of your Sunderland courier service to Japan, I wish to thank you, on behalf of all personnel of the British Commonwealth Occupational Forces, for the excellent service you have operated since the inception of the operation. Your Sunderlands and, for a short period in the early days, your Dakotas have extended the R.A.F. and B.O.A.C. air courier services operating between the United Kingdom and Hong Kong to Japan and have given all British personnel a regular and fast air mail service and a reliable and fast method of communication with their home country. This service has contributed greatly to the very high morale of British personnel serving in Japan.

"In flying this route you have had to contend with manpower and equipment shortages, with typhoons and tropical storms and servicing conditions. Despite all difficulties you have always operated a most reliable and regular service, and have maintained it without the loss of a single aircraft. On behalf of all British people in Japan, I thank No. 88 Squadron and all those others who have contributed to this splendid record of a difficult job well done."

The present Commanding Officer of No. 88 Squadron is Squadron Leader D. M. Gall, D.F.C., a Scot, who lives at Kircaldy. From September, 1946, to May, 1947, it was commanded by Wing Commander W. E. Ogle-Skan, A.F.C., of Didsbury, Manchester. The record of No. 88 Squadron is typical of other R.A.F. flying-boat units in the Far East which have played an important part in opening or reopening up countries after the Japanese occupation. No. 205 Squadron, based in Ceylon, has made regular courier and mail flights to Singapore and the Maldive Islands, and No. 209 maintained regular services with Sarawak and British North Borneo.

R.A.A.F. SQUADRONS PERPETUATED

Two of the Royal Australian Air Force wartime fighter squadrons, one of them famous during the war as a desert squadron in the Middle East, the other the Beaufighter squadron which led the smashing low-level attack on a Japanese convoy during the Battle of the Bismarck Sea, are to be perpetuated as squadrons of the peacetime R.A.A.F.

Announcing the renaming of the squadrons, the Minister for Air and Civil Aviation (Mr. Drakeford) said that the Tactical Reconnaissance Squadron at Canberra would, in future, be known as No. 3 Squadron, and that Target Towing Squadron, Richmond (N.S.W.), would be numbered No. 30 Squadron.

No. 3 Squadron, which disembarked in the Middle East in August, 1940, won, during its first 15 months, one D.S.O., six D.F.Cs., one D.F.M., and six Mentions in Despatches. Its members flew Westland Lysanders, Gladiators, Gauntlets, Hurricanes, Tomahawks, Kittyhawks and Mustangs. As part of the famous 239 Fighter-Bomber Wing of the Desert Air Force, No. 3 Squadron fought in close support of the Eighth Army under Field-Marshal The Viscount Montgomery, from Alamein in October, 1942, to the final crushing

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defeat of the German Army in Northern Italy on 2nd May, 1945.

No. 30 Squadron, led by Wing Commander Brian ("Blackjack") Walker, operated Beaufighters from Ward's airstrip late in 1942 and in the first half of 1943. On 3rd March, 13 Beaufighters led U.S. Mitchells and A20's in daring mast-head strafing attacks on a Japanese convoy in the Huon Gulf. This battle, still the highlight of the Squadron's history, and known as the Battle of the Bismarck Sea, was one of the major turning points of the war in the Pacific.

Throughout practically the whole of the Pacific War, the Beaufighters of No. 30 Squadron were active, wiping out numerous enemy aircraft, supply dumps and shipping. One of its highest scores was 98 barges and two supply ships.

Three wartime bomber squadrons with outstanding achievements in operations during the Pacific War will be perpetuated in the post-war air force as squadrons of the R.A.A.F.'s heavy bomber wing based at Amberley, Queensland. They will be renamed Nos. 1, 2 and 6 Bomber Squadrons.

No. 1 Squadron was the squadron to which Air Chief Marshal Sir Robert Brooke-Popham recently paid tribute in his official report on Malaya. During their attack on the Japanese on 7th December, 1941, the Hudsons of No. 1 Squadron killed 1,500 Japanese in seven-and-a-half hours during the initial landings on the Malayan coast. In the succeeding days they kept up their attack in patched-up aircraft against insuperable odds, with no rest because of enemy raids.

No. 2 Hudson Squadron fought an equally gallant battle from Koepang and Darwin in the early days of the Pacific War. Its aircraft carried out long, unescorted daylight reconnaissances, bombed and strafed Japanese shipping and advanced bases, protected convoys of Australian troops, and rescued hundreds and brought them safely to Darwin.

No. 6 Squadron was one of the three squadrons of Australian-built Beauforts famous for their night attacks on Rabaul Harbour and their low-level daylight raids on Gasmata during 1943.

CITIZEN AIR FORCE SQUADRONS

Citizen Air Force fighter squadrons are being formed this month in Victoria, New South Wales, Queensland and Western Australia, according to an announcement by the Minister for Air and Civil Aviation (Mr. Drakeford).

The squadrons being formed are: No. 21 "City of Melbourne" Squadron, at Laverton (Victoria); No. 22 "City of Sydney" Squadron, at Bankstown, New South Wales; No. 23 "City of Brisbane" Squadron, at Archerfield (Queensland); and No. 25 "City of Perth" Squadron, at Pearce (Western Australia).

The Minister said that each of these fighter squadrons, which would be manned by approximately 40 per cent. Permanent Air Force personnel and 60 per cent. part-time Citizen Air Force volunteers, would be equipped initially with Mustangs and at a later date with Australian-built Vampire jet-driven aircraft.

Mr. Drakeford said: "This is an important step in the re-establishment of the nation's peacetime Air Force, for every Australian will remember the tremendous value of the Citizen Air Force squadrons to the R.A.A.F. immediately after the outbreak of hostilities in 1939. The Citizen Air Force squadrons will again be the means of providing Australia with a team of fully trained pilots capable of taking part in immediate operations should the occasion arise."

POINT COOK AGAIN FLYING COLLEGE

Point Cook, Royal Australian Air Force Station near Melbourne, Victoria, has reverted to its former role as a peacetime flying training school. Fourteen of the first intake of 24 cadets into the college have begun a four-year course for future officers. The remaining ten will arrive shortly.

Others who have arrived at Point Cook are: 22 flying personnel who have entered the Service for training as trainee pilots; 21 serving members of the R.A.A.F. (all musterings ranking from A.C.1 to Warrant Officer) recruited as trainee pilots under the new Royal Australian Air Force N.C.O. scheme. They come from many R.A.A.F. commands and include Sergt. R. E. Trebilico, a linguist from B.C.O.F., Japan; and 14 Royal Australian Navy personnel who will train as pilots for the Fleet Air Arm.

The 57 airmen will be trained together in an 18 months' course. The next course will begin in six months.

Three Distinguished Flying Cross winners have appointments on the new R.A.A.F. College staff. They are the Commandant, Air-Commodore E. V. Hancock, O.B.E., D.F.C.; the Assistant Commandant, Wing Commander A. B. McFarlane, D.F.C.; and Squadron Leader L. T. Spence, D.F.C.

Behind the establishment of the R.A.A.F. College is the story of the growth of the Australian Air Force since its birth in 1914, when the Central Flying School was formed there. It had two officers, four mechanics, one clerk and a caretaker, representing the personnel of the aviation instructional staff of the Australian Flying Corps —the first separate Dominion air arm.

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Two years earlier, H. A. Petrie and the late E. Harrison, who was later to become the R.A.A.F. Director of Aeronautical Inspection, had been commissioned in the Australian Military Forces as the first two officers of the A.F.C. They arrived in 1913 with mechanics and two BE2A aircraft, two Deperdussins and one Bristol aircraft. For a base the Defence Department bought 734 acres at Point Cook.

The first flying course began on 17th August, 1914. One of the students was Lieut. R. Williams—later to become the first Air Marshal of the R.A.A.F. and now Director-General of Civil Aviation.

The first unit went to German New Guinea in November, 1914, commanded by Lieut. Harrison with one BE2A and a Farman seaplane. The unit saw no action and returned early in 1915, but it was the first flying unit of any Dominion to see oversea service.

The Treaty of Brussels

FULL TEXT

The Treaty of Brussels was signed on 17th March, 1948, by the plenipotentiaries of five Western European Powers: Belgium, France, Luxembourg, the Netherlands and the United Kingdom. The full text, printed below, is reproduced, with permission, from "The Times," of 18th March, 1948.

The text of the treaty signed in Brussels yesterday is as follows:

His Royal Highness the Prince Regent of Belgium, the President of the French Republic, President of the French Union, Her Royal Highness the Grand Duchess of Luxembourg, Her Majesty the Queen of the Netherlands, and His Majesty the King of Great Britain, Ireland and the British Dominions beyond the Seas,

Resolved to reaffirm their faith in fundamental human rights, in the dignity and worth of the human person and in the other ideals proclaimed in the Charter of the United Nations; To fortify and preserve the principles of democracy, personal freedom and political liberty, the constitutional traditions and the rule of law, which are their common heritage; To strengthen, with these aims in view, the economic, social and cultural ties by which they are already united; To co-operate loyally and to co-ordinate their efforts to create in Western Europe a firm basis for European economic recovery; To afford assistance to each other, in accordance with the Charter of the United Nations, in maintaining international peace and security and in resisting any policy of aggression; To take such steps as may be held to be necessary in the event of a renewal by Germany of a policy of aggression; To associate progressively in the pursuance of these aims other States inspired by the same ideals and animated by the like determination;

Desiring for these purposes to conclude a treaty for collaboration in economic, social, and cultural matters and for collective self-defence,

Have appointed as their plenipotentiaries . . ., who, having exhibited their full powers found in good and due form, have agreed as follows:

Article I.—Convinced of the close community of their interests and of the necessity of uniting in order to promote the economic recovery of Europe, the High Contracting Parties will so organize and co-ordinate their economic activities as to produce the best possible results, by the elimination of conflict in their economic policies, the co-ordination of production and the development of commercial exchanges.

The co-operation provided for in the preceding paragraph, which will be effected through the Consultative Council referred to in Article VII as well as through other bodies, shall not involve any duplication of, or prejudice to, the work of other economic organizations in which the High Contracting Parties are or may be represented, but shall on the contrary assist the work of those organizations.

Article II.—The High Contracting Parties will make every effort in common, both by direct consultation and in specialized agencies, to promote the attainment of a higher standard of living by their peoples and to develop on corresponding lines the social and other related services of their countries.

The High Contracting Parties will consult with the object of achieving the earliest possible application of recommendations of immediate practical interest, relating to social matters, adopted

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with their approval in the specialized agencies.

They will endeavour to conclude as soon as possible conventions with each other in the sphere of social security.

Article III.—The High Contracting Parties will make every effort in common to lead their peoples towards a better understanding of the principles which form the basis of their common civilization and to promote cultural exchanges by conventions between themselves or by other means.

Article IV.—If any of the High Contracting Parties should be the object of an armed attack in Europe, the other High Contracting Parties will, in accordance with the provisions of Article 51 of the Charter of the United Nations, afford the party so attacked all the military and other aid and assistance in their power.

Article V.—All measures taken as a result of the preceding article shall be immediately reported to the Security Council. They shall be terminated as soon as the Security Council has taken the measures necessary to maintain or restore international peace and security.

The present treaty does not prejudice in any way the obligations of the High Contracting Parties under the provisions of the Charter of the United Nations. It shall not be interpreted as affecting in any way the authority and responsibility of the Security Council under the Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security.

Article VI.—The High Contracting Parties declare, each so far as he is concerned, that none of the international engagements now in force between him and any other High Contracting Party or any third State is in conflict with the provisions of the present treaty.

None of the High Contracting Parties will conclude any alliance or participate in any coalition directed against any other of the High Contracting Parties.

Article VII.—For the purpose of consulting together on all the questions dealt with in the present Treaty, the High Contracting Parties will create a Consultative Council, which shall be so organized as to be able to exercise its functions continuously. The Council shall meet at such times as it shall deem fit.

At the request of any of the High Contracting Parties, the Council shall be immediately convened in order to permit the High Contracting Parties to consult with regard to any situation which may constitute a threat to peace, in whatever area this threat should arise; with regard to the attitude to be adopted and the steps to be taken in case of a renewal by Germany of an aggressive policy; or with regard to any situation constituting a danger to economic stability.

Article VIII.—In pursuance of their determination to settle disputes only by peaceful means, the High Contracting Parties will apply to disputes between themselves the following provisions:

The High Contracting Parties will, while the present treaty remains in force, settle all disputes falling within the scope of Article 36, paragraph 2, of the Statute of the International Court of Justice by referring them to the court, subject only, in the case of each of them, to any reservation already made by that party when accepting this clause for compulsory jurisdiction to the extent that that party may maintain the reservation.

In addition, the High Contracting Parties will submit to conciliation all disputes outside the scope of Article 36, paragraph 2, of the Statute of the International Court of Justice.

In the case of a mixed dispute involving both questions for which conciliation is appropriate and other questions for which judicial settlement is appropriate, any party to the dispute shall have the right to insist that the judicial settlement of the legal questions shall precede conciliation.

The preceding provisions of this article in no way affect the application of relevant provisions or agreements prescribing some other method of pacific settlement.

Article IX.—The High Contracting Parties may, by agreement, invite any other State to accede to the present treaty on conditions to be agreed between them and the State so invited.

Any State so invited may become a party to the treaty by depositing an instrument of accession with the Belgian Government.

The Belgian Government will inform each of the High Contracting Parties of the deposit of each instrument of accession.

Article X.—The present treaty shall be ratified and the instruments of ratification shall be deposited as soon as possible with the Belgian Government.

It shall enter into force on the date of the deposit of the last instrument of ratification and shall thereafter remain in force for 50 years.

After the expiry of the period of 50 years, each of the High Contracting Parties shall have the right to cease to be a party thereto provided that he shall have previously given one year's notice of denunciation to the Belgian Government.

The Belgian Government shall inform the Governments of the other High Contracting Parties of the deposit of each instrument of ratification and of each notice of denunciation.

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BOOK REVIEWS

AIR POWER IN WAR, by Marshal of the Royal Air Force The Lord Tedder, G.C.B. (Chief of the Air Staff). Hodder & Stoughton; 9s. 6d. (124 pages with ten statistical graphs and two maps.)

This book, which consists of the four Lees Knowles lectures delivered at Cambridge University in 1947, can be read comfortably at one sitting in two hours. But that is not to say that it should be so read, except as a first reading to be followed by a more thoughtful and consequently more lengthy study. Yet it is better to read it in two hours than not to read it at all. Furthermore, it ought to be read by every Air Force officer and by officers of the Navy and Army as well. Nor should it be confined to the commissioned ranks only; for all airmen and airwomen, and particularly aircrew, will find in it a mass of interesting detail, revealing the manifold functions and achievements of the Service in war (to which all ranks contribute) and expressed in language that will be readily understood.

The Chief of the Air Staff adopts a detached, though by no means disinterested, attitude to his subject. He contemplates war in general, and the two World Wars in particular, as it were from Olympian heights; yet never for a moment is the reader allowed to forget that the matters under consideration are of the most vital importance to him personally, to the nation as a whole, to the Commonwealth and Empire, and to civilization itself. And in spite of this concentration on past experience (which, after all, is the only safe foundation upon which to build future policy) the C.A.S. succeeds in avoiding the danger of preparing for the last war over again. "For our future security," he says, " we must look *forward from* the past and its lessons, not *back to* the past." (The italics are his.)

In his first lecture, on "The Unities of War," Lord Tedder insists on the fact that, while each of the three Fighting Services has its own particular part to play, the operations of each are bound up with and dependent upon those of the other two. This, he says, was scarcely recognized in World War I; but it was recognized during World War II, and its recognition contributed largely to the success of the Allies. He also points out, quoting from Admiral Mahan, how necessary it is for a nation such as ours, which does not maintain large military establishments in peace, to ensure that it is strong enough, when war breaks out, to gain the time necessary for putting the nation on a war footing, for reorganizing its industries and services, and for building up the production of war supplies to a scale adequate for the maintenance of the armed forces at full strength. And he reminds us that far more attention should be paid to economy of force—"not the false economy got by doing things on the cheap, but the economy which comes from efficiency." In recommending the provision of bomber aircraft, even for defence, he says: "An air force composed of fighters alone is not an air force and is not a defence. The most effective defence against air attack is to stop it at its source, and in future it may become the only way."

In the second lecture, on "Air Superiority," the C.A.S. shows how "the outstanding lesson of the late war was that air superiority is the pre-requisite to all war-winning operations, whether at sea, on land or in the air." And, lest the foregoing be misleading, he makes it quite clear that air superiority has not only to be won but also to be maintained throughout the war. "The air battle is continuous, and when it is won the war is all but won." He offers no infallible prescription for establishing air superiority. "There is, in fact, no rule-of-thumb solution to the problem of securing air superiority, no simple formula. . . . Air superiority is a subtle question; before one has seen the results which flow from it, I think one can only sense it."

The third lecture is entitled "Air Power in Relation to Sea Power." Sea power is still essential to us but it is now partly maintained by the air arm, which is essential to supremacy at sea and to its effective application. This was shown most dramatically in the vast spaces of the Pacific Ocean where air power proved itself "a vital and perhaps the dominant factor in sea power." To the question "whether the possibilities of airborne invasion of the British Isles vitiate sea power as one of the main pillars of our security," Lord Tedder offers the answer that airborne invasion, properly planned and under cover of air superiority, will succeed; but sooner rather than later it must become dependent upon water-borne or land-borne supply.

The last lecture is devoted to "The Exercise of Air Power." In it the C.A.S. examines the very many ways in which air power can be exploited and applied to the winning of a war. He calls for a clear answer to the question, "how much air power by itself can contribute to the winning of a war?"; but he also insists that "there must be no finality to that answer—it must be continually adjusted to keep pace with the developments which science and technology bring." Air forces, he proceeds to point out, are extremely flexible, so that they can easily be switched from one task to another and operate at great distances from their bases. But their very flexibility renders centralized control an imperative necessity; otherwise there will be dissipation of strength and resources and, as a consequence, wasted effort. The experiences so far gained throughout the war in the exercise of air power were all applied with outstanding success in preparing for, and covering, the grand assault on the German continental fortress and in assisting our land forces to advance across France and Belgium and Holland and into Germany, while still maintaining, by constant vigilance and offensive action, that continuous air superiority which was essential to the success of the operations. Finally, the lecturer utters a warning not to base our peace-time policy for defence on the experiences of the days of plenty, when our fighting forces were fully supplied with all the equipment they needed and reserve supplies were ample. "When the purse strings are loose, the thinking is apt to be loose, too; and financial stringency leads to careful budgeting."

I hope I shall neither offend Lord Tedder nor mislead my readers when I say that he is a "prophet" in the true Biblical sense of the word; for, like the great prophets of Judah and Israel, he analyses the past and the present, picks out examples of wisdom and folly, and draws from them lessons for the future. Nor is it an exaggeration to say that the future air policy of the nation will succeed according to the measure of its faithfulness to the guidance offered by the present Chief of the Air Staff.

R. F. P.

PLAIN WORDS, A Guide to the Use of English, by Sir Ernest Gowers. H.M.S.O.; 2s. net.

This is a serious book but it is also entertaining, and for that reason it should be instructive. The author, a distinguished civil servant, follows Sir Alan Herbert, Sir Arthur Quiller-Couch and a long line of literary men

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who have deplored and sought to arrest the maltreatment of the English language.

The work is primarily intended for "officials," among whom are included not only civil servants but also members of the great public corporations and of the Navy, Army and Air Force. It does, in fact, apply to all whose duty it is to express ideas on paper for the information and guidance of others.

"The difficulty (in writing)," said Robert Louis Stevenson, "is not to write, but to write what you mean, not to affect your reader, but to affect him precisely as you wish." And who has not complained at the woolly, obscure and inelegant language he is often forced to read in official documents and communications, routine orders and the like? Even that most respectable of newspapers, *The Times*, is not free from the kind of jargon at the suppression of which this book is aimed.

Sir Ernest Gowers seeks to induce all who write to choose words and phrases which most accurately express their meaning, instead of putting down the first ones that come to mind. And he gives copious examples of how to do it as well as how not to do it—the latter providing much of the entertainment. He advocates a critical review of one's own writings which, after due consideration, will often reveal themselves as meaning the opposite of what was intended—or nothing at all. One reason why we are careless in our writing is because we know what we want to say (usually) and we think that our readers will, by reading what we have written, also know what we want to say. This is a fallacy. Readers may, and often do, get an entirely wrong idea of what the writer means. And if that is due to careless composition, as it usually is, then the fault is with the composer.

The author devotes four chapters out of eleven to "The Choice of Words," one to their "Handling" and one to "Punctuation." He also gives an illuminating explanation of what is called "Legal English." There is no chapter on "Style," which, as Sir Ernest points out, will look after itself if sufficient care is taken to express good ideas in the best possible way.

For entertainment, the book may well be kept by the bedside or taken on a railway journey. But for serious study (for which it was intended) each chapter should be read and re-read thoughtfully. Treated thus, it cannot fail to benefit the reader. Nevertheless, if any reader wishes to obtain from it full value (and that is infinitely more than the two shillings he will have paid for it), the following procedure is recommended:

First let him study it carefully; next let him try to write as Sir Ernest Gowers would have him write; then let him get a friend, who has also studied the book, to criticize his writing in the light of what Sir Ernest says. Above all, let him not be offended at the criticism. He will certainly get his own back if he is allowed, in turn, to criticize the friend's writing. R. F. P.

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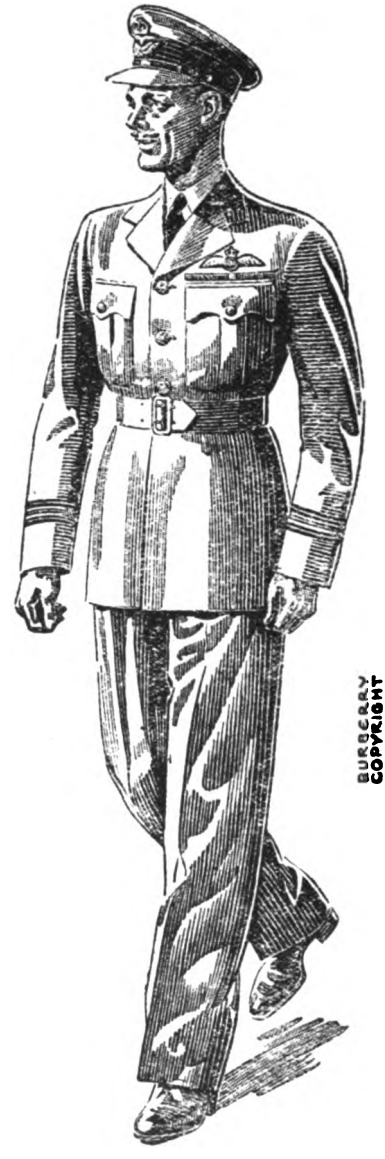

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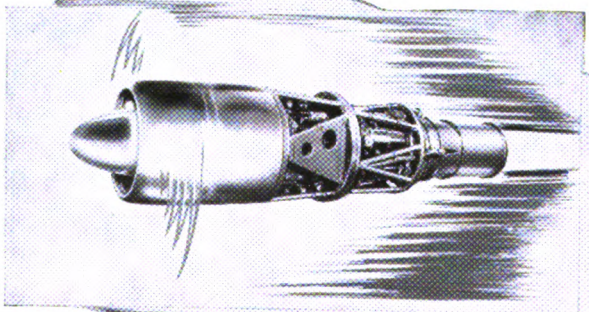

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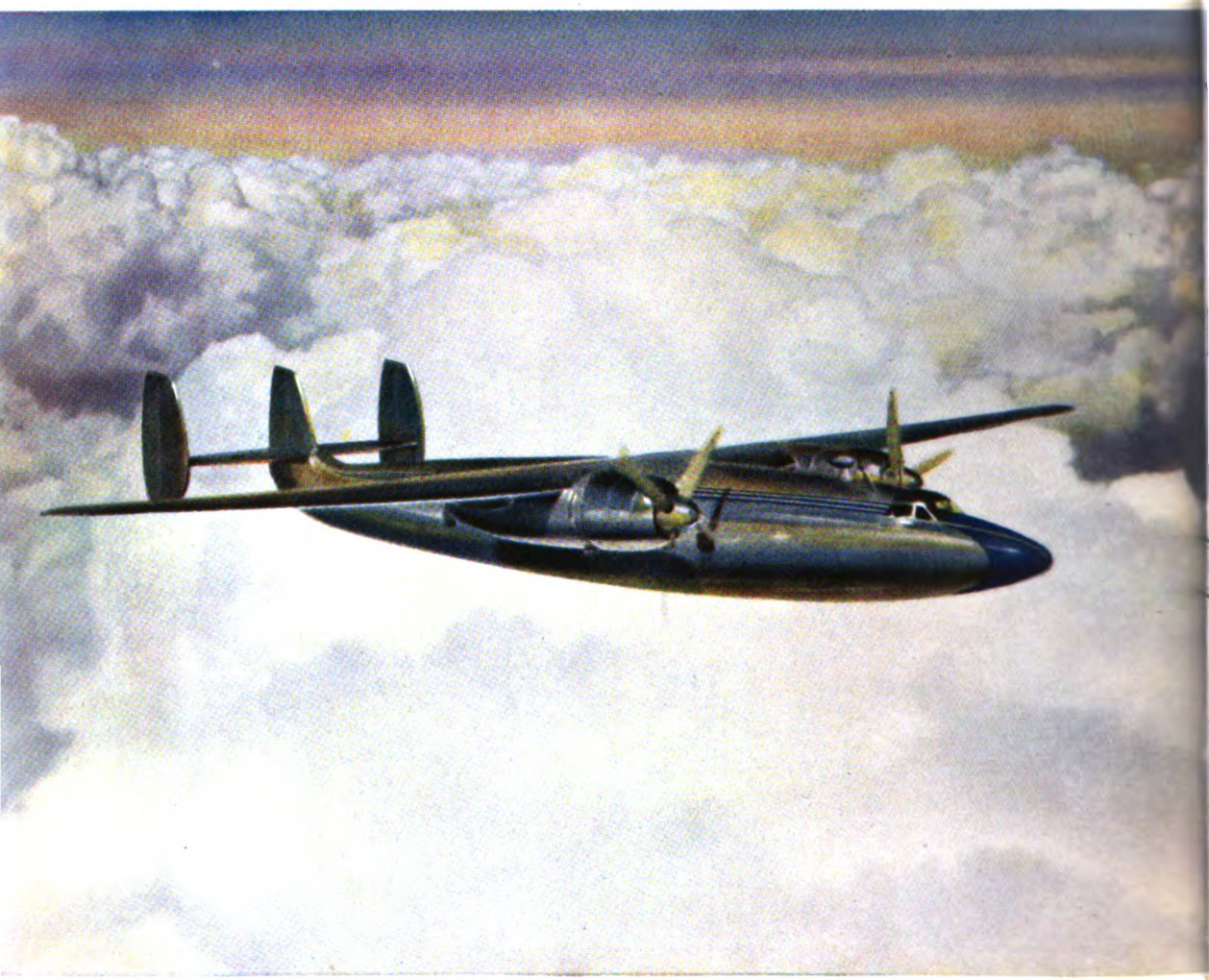

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EMPIRE AIR FORCES JOURNAL

EDITOR:

GROUP CAPTAIN A. H. STRADLING, O.B.E., R.A.F. (RET.)

Assisted by an Advisory Committee of Members of the R.A.F. and Air Forces of the Dominions

VOLUME XIX | OCTOBER, 1948 | NUMBER 4

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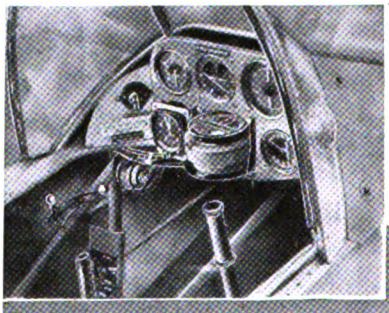

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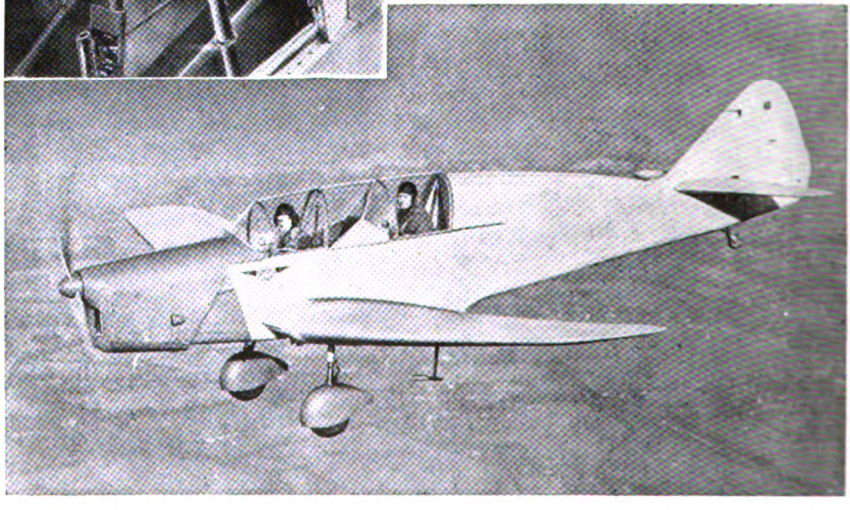

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Editor's Notes

POLICY FOR 1949

THE aim of the Editor is to dwell less on the achievements of the past (except those influencing tradition), more on what is taking place in the world today, and to publish articles that will stimulate helpful discussion in the future.

He will endeavour to obtain more contributions concerning the Dominion Air Forces and, if sufficient material is received, a complete section of the journal will be devoted to this purpose.

It is proposed to introduce new features of general interest, such as a permanent Sports Page, in which will be reported selected sports activities of special interest, such as inter-Service contests, international events in which R.A.F. personnel or those of the Dominion Air Forces take part, etc. In addition, "matters concerning personnel" will be introduced, giving particulars of new appointments, promotions, honours, retirements, etc.

If a suitable biographer can be found a series of biographies of well-known airmen will also be included.

Another series the Editor hopes to introduce is one dealing with the everyday life on various stations of the Air Forces at home and abroad.

THE OCTOBER NUMBER

For a new editor to have to apologize to his readers when issuing his first number is somewhat humiliating. Nevertheless, he apologizes for the month's delay, but assures you at the same time that it was due to circumstances beyond his control. The various processes of producing "galley proofs," checking them, making up in "page proofs," checking these, producing blocks for illustrations, printing, binding, trimming, etc., take on an average seven weeks. Therefore, to produce the journal on 1st October it is necessary for the Editor to obtain 50,000 words of "copy," have it reviewed by the Air Ministry and passed in form ready for printing first proofs by 13th August. Your new Editor was appointed on 1st August, 1948. The fact that most of the articles published are normally written three months before the number is issued is worthy of note. When written on political situations which are apt to change rather quickly, this can, at times, be embarrassing.

AIR MINISTRY ADVISORY COMMITTEE

It may have escaped the notice of readers, despite reference to the fact on the title page, that the Editor is assisted by an Advisory Committee, the Chairman of which is the Director of Staff Training, and it is formed of representatives from the Director of Personnel Services, Director of Organization, the Staff College and the Dominion Air Forces. It is hoped to add representatives from the Admiralty and War Office at an early date.

The Editor wishes to acknowledge the great assistance given to him by this Committee on taking over the editorship and the expeditious manner in which the staff of D.S.T. reviewed and passed for publication articles submitted to them at very short notice.

CONTRIBUTIONS FROM SERVING OFFICERS

Normally every serving officer is obliged (by K.R. and A.C.I.) to submit any manuscript for publication through his commanding officer to the Air Ministry. A special privilege has been granted to officers submitting articles for THE R.A.F. QUARTERLY, permitting them to pass their manuscripts direct to the Editor, on the distinct understanding that he submits them personally to the Director of Staff Training, whose approval is necesary before they can be published. There is a great saving of time by this arrangement, and the privilege is appreciated.

CORRESPONDENCE

The Editor is pleased to receive letters from readers and later a section of the journal will be set aside for those who would like their letters published. Articles written on controversial subjects sometimes bring criticism; when constructive, this is helpful, and sometimes a useful exchange of ideas arises therefrom. Criticism of an article in the July number entitled "R.A.F. Morale and the Changing Concept of Discipline" was received and in consequence another article on this subject, containing another viewpoint, has been included in the October number.

Authors alone are responsible for the contents of their respective papers.

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PUBLISHER'S ANNOUNCEMENT

WITH this, the Autumn Number of the ROYAL AIR FORCE QUARTERLY, the publishers wish to announce the resignation of Wing Commander C. G. Burge, O.B.E., from the Editorship of the ROYAL AIR FORCE QUARTERLY and the appointment of Group Captain A. H. Stradling, O.B.E., to the Editorial chair.

Wing Commander Burge, who has been associated with the ROYAL AIR FORCE QUARTERLY since its inception, joined the Royal Flying Corps in September, 1915, from the York and Lancaster Regiment, to which he had been commissioned in January, 1913, from Sandhurst.

Wing Commander Burge joined No. 12 Squadron, R.F.C., in the B.E.F. in December, 1915, as a Flying Officer "Observer." Early in 1916 he attended a flying course with No. 1 Squadron and became a Flight Commander later that year and a Squadron Commander the following year. He commanded Nos. 33, 36 and 100 Squadrons, was mentioned in dispatches twice and was awarded the O.B.E. in 1919.

It was in August, 1919, that he was granted a permanent commission in the R.A.F. and joined the R.A.F. Cadet College, Cranwell, as its first Adjutant in 1921.

From the beginning of 1922 he was on flying duties at the Cadet College until September, 1925, when he attended a twelve months' course at the R.N. Staff College, Greenwich. In August, 1926, he became Personal Assistant to the Chief of the Air Staff for fourteen months, was temporarily attached to the School of Army Co-operation for two months, and during 1928 was on a course at the Army Staff College, Camberley.

Wing Commander Burge retired from the Active List in December, 1928.

His experience since the early days of the R.F.C. and R.A.F. proved invaluable in his Editorship of the ROYAL AIR FORCE QUARTERLY from its inception.

He became associated with the Publishing House of Sir Isaac Pitman & Sons Ltd. as Managing Editor of Aeronautical Publications in 1934 and is still actively concerned with that house. From 1936-45 he served in a special Civil Service appointment on Industrial Intelligence.

Group Captain A. H. Stradling, who has assumed the Editorship recently retired from the Active List, after more than 30 years in the Service.

During his service, of which 16 years were spent overseas, he has had 20 years' experience as a Staff Officer, as well as that gained with units of the Royal Air Force at Manston, Kenley, Basra, Hinaidi, Abu-Suier, Uxbridge, Netheravon, Halton, Loughborough and Cranwell.

He began his service career in the London Scottish in 1914, commissioned in the Gordon Highlanders, he served in the early stages of the 1914-1918 war in the 51st (Highland) Division. After the Battle of the Somme he was seconded to the Royal Flying Corps as an Observer in No. 11 Squadron. In the latter part of that war he held appointments as Wing Adjutant (2nd and XIth Wings), Staff Captain (2nd Brigade) and Deputy Assistant Adjutant General on the Staff of General Trenchard. During the occupation of Germany he held a similar appointment at Headquarters of the Rhine Army, and having completed more than five years in Belgium, France and Germany he returned to England in 1920. He was mentioned in dispatches on three occasions and awarded the O.B.E.

In the period between the two wars, after qualifying as a pilot, he held various staff appointments on the Personnel and Training Staffs at the Air Ministry and similar posts in Iraq and Egypt.

At the beginning of the World War he was Commandant and Chief Instructor of the R.A.F. School of Administration, until posted as Staff Officer i/c Administration of No. 1 (Bomber) Group, subsequently returning to Egypt as B.P.S.O. Middle East. He was placed on the "Retired List" after the war whilst serving as Staff Officer i/c Administration of No. 24 (Training) Group.

Group Captain Stradling's long and varied service gives him the advantage of a wide knowledge of Service affairs, which should prove of the greatest value in his new appointment as Editor of the ROYAL AIR FORCE QUARTERLY.

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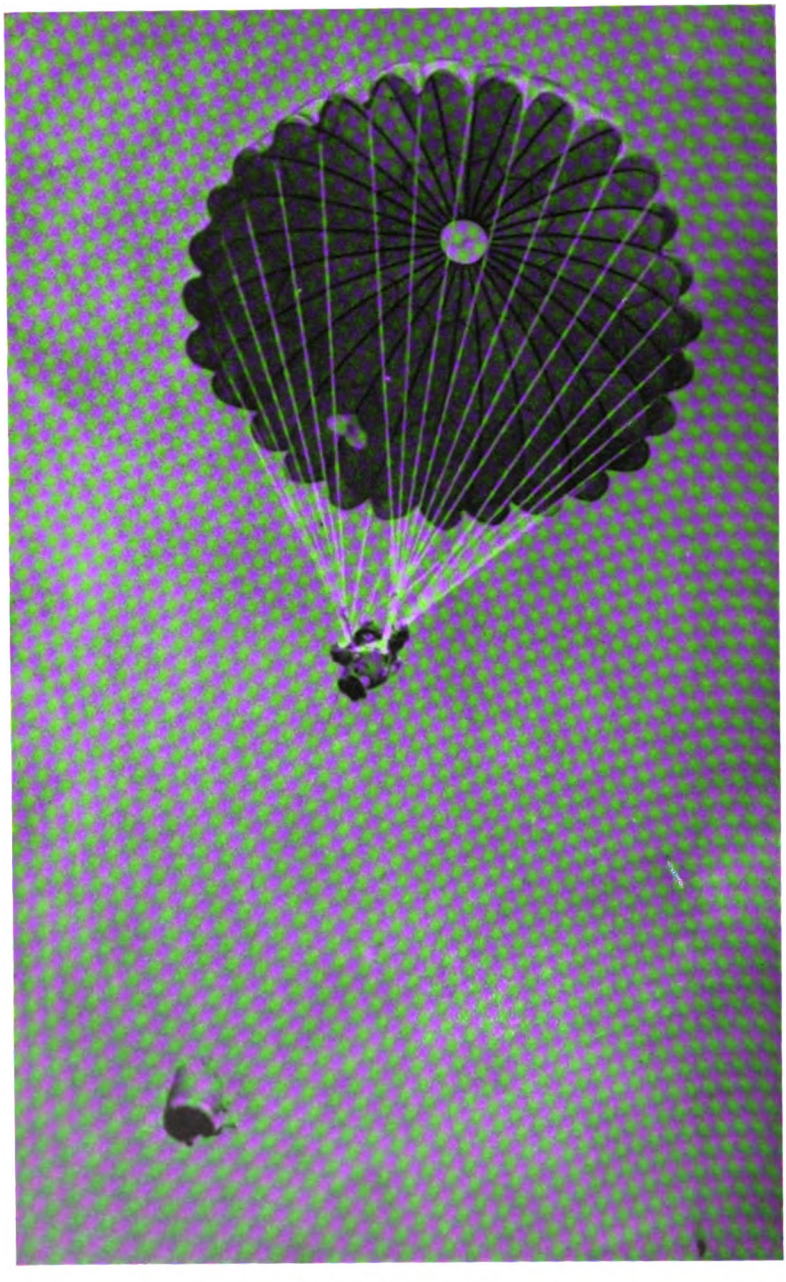

AIRBORNE FORCES

See "Some Reflections on Airborne Forces," by Air Chief Marshal Sir John Slessor—page 197

Frontispiece

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EDITORIAL

THE DEFENCE OF PEACE

THE announcement by His Majesty's Government, at the beginning of the Short Session of Parliament on 14th September, of "measures to strengthen the armed forces," was overt practical recognition of the possibility of danger from abroad. Precisely what that danger is perhaps no one outside the Foreign Office can say. But whether it is the danger of war or the danger of successful bluff, it is certain that a strengthening of the armed forces will reduce the danger. Our forces are defensive forces. They are not at present called upon to defend our country against a threat of invasion; but they are required to defend our freedom and our peace against the menace to both which is developing in Eastern Europe and beyond.

As we write, attention is still focused on the long-protracted meetings in Moscow between the representatives of the three Western Powers, the United States, France and the United Kingdom, and Mr. Stalin and Mr. Molotov of the Soviet Union. Secrecy is being preserved as to what is transpiring at these meetings and as to what form the next moves will take. Indeed Mr. Marshall, the United States Secretary of State, has very rightly said that speculation on these points at the present time might be very harmful. We therefore avoid speculation, which in any case would be sheer guessing. But we permit ourselves an examination of the situation.

The Russians, for reasons best known to themselves, have seen fit to establish a blockade of the American, British and French Sectors of Berlin; so that two million Germans, as well as the American, British and French troops with their families have been threatened with starvation. The reasons given were to protect the Russian currency recently established in the Eastern (Russian) Zone of Germany (including the Russian Sector of Berlin) from devaluation due to the use of Western German currency in the Allied Sectors of Berlin. The explanation offered of their refusal to allow rail and road traffic to proceed to Berlin from the Western zones was that it was necessary to repair certain bridges which had become dangerous; and the explanation of their stoppage of canal traffic into Berlin from the West was the need to repair certain locks. This complete stoppage of all surface transport between the Western zones and Berlin left only the air link; and it is by this air link that the American and British Air Forces are triumphantly supplying the Allied sectors of Berlin with food and some coal, thus breaking the blockade. But the blockade is only partly broken. It would be impossible by air to supply the Western sectors of Berlin with the raw material for their industries; consequently unemployment is already serious and will become more serious as more industries come to a standstill, unless the Russians raise the blockade by allowing normal means of transport to be resumed.

Nor is this by any means the full extent of their sabotage. The Kommandatura, which constituted the four-Power control of the city, has not met since 1st July owing to Russia's refusal any longer to take part in its activities; and, lately, by inciting the Communists in the Russian Sector, they have made it impossible for the City Assembly to meet in the Stadthaus, and its democratic majority has been forced to hold its meetings in the British Sector.

There is no doubt that Russia's blockade of the Allied sectors of Berlin and her other acts of sabotage are political moves, designed to provide her with bargaining counters in her negotiations with the Western Powers. A temporary deadlock was caused, before the Moscow discussions began, by the American and British joint refusal to negotiate until the blockade had been lifted and by the Russian refusal to enter into negotiations depending upon prior conditions (*i.e.*, the condition that the blockade be lifted first). However, talks are proceeding at the Kremlin; and since both parties to these talks will have something to gain by coming to an agreement, however small, it may safely be assumed that something will come of them.

Secret or Open Diplomacy

Before leaving this subject for the time being, which we must do for want of information, we may pause to recognize that these talks behind closed doors, and without

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the glaring publicity of Press and news reel that have characterized so many international conferences during the past few years, mark a return—perhaps we may be permitted to say a welcome return—to the practice of secret diplomacy.

Open diplomacy has been given a fair trial, as was only natural in view of the spread of education and of democratic ideas. But it has been found to have far too many drawbacks. The ideas which lie behind open diplomacy are: (i) that the people are entitled to know what is being said by their representatives when discussing matters which may involve whole nations in war; and (ii) that when those representatives are compelled to carry on their discussions in the full glare of publicity (represented by cinema cameras, flashlight photographs and verbatim reports of all speeches), they would be less likely to bargain away the people's economic interests and territorial rights and to plunge the peoples they represent into war.

Unfortunately things have not worked out quite like that. Publicity has certainly moderated the proceedings; but to the extent that no decision on any major issue has been or can be reached. And the reason is both simple and obvious. Representatives at these public conferences, confronted everywhere by microphones, and knowing that their every word is being taken down in shorthand and will be printed in a thousand newspapers the next day, very naturally study the effect their recorded speeches will have on their own people and therefore dare not even suggest giving way on any part, even for the sake of compromise, lest they be accused by their own people of weakness. Thus the so-called international conference becomes nothing more than a series of political addresses directed to the public and in no way a discussion calculated to reach agreement. This being recognized, it is not surprising that no agreement is reached. But now that the practice of secret diplomacy is being resumed, some settlement of the major international difference may be expected.

THE DANUBE QUESTION

Typical of Russia's international diplomacy at the present time is her conduct in the Danube Conference at Belgrade in August this year.

The Danube question is primarily a commercial matter; but it has important political aspects. The Danube is the most important inland waterway in Europe. It provides a commercial waterway for no fewer than eight separate nation-states, through or by which it passes in its long course to the sea, connecting them with each other and with the outside world and in particular with Great Britain, America and France. Before the Second World War, 1939-45, the United Kingdom enjoyed considerable trading privileges with all the nation-states on the banks of the Danube and British companies operated a fleet of steamships on the river. Commerce and traffic on the Danube were regulated by an international commission appointed in 1921. Naturally this international regulation was suspended during the war; but it was reasonable to expect that after the war the international commission would resume control as before, and the Western Powers sent their delegates to the Belgrade Conference with this assumption in mind. They were disappointed.

The political situation, they found, had changed. Of the eight nation-states whose territories lie along the Danube, six are more or less under Russian control; Germany has at present no government and therefore neither representation nor vote in the conference; and Austria, though represented, has no vote because Russia will not allow her any. Thus Russia controls seven votes (her own and those of her six satellites) against the three votes of Great Britain, America and France. Therefore Russia is in a position to dominate the conference, an advantage she was not slow to seize. She proposed and carried a resolution to the effect that, while the river was to be free and open to the commerce of all nations, traffic on the river and in its ports should be regulated by a body representing the riparian states only. As seven of these (including Austria) are under Russian domination, that meant that Russia would enjoy complete control.

The three Western Powers refused to subscribe to this preposterous proposal and "walked out," announcing that they still regarded the decision of the 1921 conference as operative, since "an international agreement which forms part of the public law of Europe cannot be cancelled unilaterally by some of the parties to it without regard

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to the wishes of the others" (Scrutator). Although we cannot at present prevent the adoption of the Russian proposal, since Russia is in a position to enforce it, by taking our stand on the 1921 Convention we shall be free, at any suitable future time, to reassert the claim for international control which we have never renounced.

TITO AND THE COMINFORM

The disagreement between Marshal Tito, dictator of Yugoslavia, and the Cominform, which has been going on since the spring of this year, is significant both of the policy of the central executive of the Communist Party in Russia and the reactions to this policy on the part of the satellite states of Eastern Europe.

From the mass of charges and counter-charges that have been made between Marshal Tito and the Cominform (the latter acting, no doubt, under direct and detailed instructions from Moscow), there emerges one clear fact. Tito's principal offence was "nationalism." He is an orthodox Communist, it appears, but he wants to run his country by himself and not to be directed in detail by the Kremlin. Still less is he willing to be the instrument whereby his country will eventually be annexed and absorbed into the Soviet Union as one of the "socialist soviet republics," which appears to be the inevitable fate of any country that comes under Russian influence today.

Yugoslavia is not the only one of the Russian satellite states of Eastern Europe which has shown some opposition to the extension of Russian influence and to the tightening of Russian control. In Poland there has been—at least until recently—a reactionary movement of nationalism in opposition to the spread of Russian influence in the country. That movement found its spearhead in Mr. Gomulka, Vice-Premier of Poland and at that time Secretary-General of the Polish Communist Party. But Mr. Gomulka has lately been "in retreat" and has emerged a converted man, and a loyal servant of the Kremlin. So Tito is the only ruler of a satellite state who has stood up to Moscow and so far "got away with it." What that may mean in a future line-up in Europe cannot be foreseen, but it indicates that the Kremlin will not achieve its object without a struggle.

That raises the question: What is the Kremlin's object? Its immediate objectives and its methods of reaching them are plain. It wants full control of the states on its western borders; and it is gaining this control by systematically increasing political and economic pressure, stage by stage, following a recognizable plan. But why? Is it the wish to spread Communism first in Europe and then throughout the world; or is it a purely defensive policy designed to strengthen the defences of the Soviet Union against possible aggression from the West; or is it merely the lust for power? Doubtless there is something of the last in it; but certainly either or both of the other two motives would account for this ruthless extension and intensification of influence.

"Russia lives in expectation of war," wrote "A Student of Europe" in the *Sunday Times* of 15th August. And in a war against the West she would feel much more secure if her six satellites were incorporated in the Soviet Union than if they remained six separate nation-states, even though Communist in their principles. That is the Russian strategy, and as strategy it cannot be condemned. But it is both dangerous and costly in its application. The Communist parties which at present "run" the satellite states under Russian direction are generally minority parties, and so they do not rest on a firm basis of popular support. If an invader entered their countries the majority parties would almost certainly seize the opportunity of turning upon them with disastrous and horrible consequences—for them. If, however, Russia, were to take the initiative and advance through and from them into Central and Western Europe, there would be little danger of anti-Communist risings. And in these circumstances Russia might well spare herself the trouble of "absorbing" her satellites.

The fact that she persists in her policy of absorption (evidenced by a steady tightening of control and by the calling of recalcitrants to order—successfully in the case of Poland, unsuccessfully (so far) in Yugoslavia—seems to indicate that her strategy is defensive. But too much reliance should not be placed on this argument, for obvious reasons, and the most obvious is Russia's recent practices in Berlin, which can indicate only an aggressive policy.

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THE REAL DANGER OF COMMUNISM

In view of the manifest danger to Western Europe, revealed by a long series of "diplomatic" moves by the U.S.S.R., of which the latest is her attempt to drive the Western Powers out of Berlin, it is well to consider exactly what this danger consists of. To talk of imminent war is, as General Smuts points out, to view the situation in distorted perspective. There is clearly a *threat* of war which, from the point of view of the threatener, may be as effective as a successful real war—at least, he hopes so. But if he is bluffing, as he almost certainly is, then some counter-measures are necessary on the part of the Western Powers. They must call his bluff by accepting his challenge and showing themselves ready to fight a war if need be in defence of their liberties. This is being done, and the announcement by the British Government on 14th September is the latest indication of it.

The policy of the Kremlin is to spread Communism (whether for offensive or defensive purposes is not clear, but the distinction is of no present consequence) by peaceful penetration, *i.e.*, by fifth-column methods backed up by the threat of war. A counter-threat on the part of the Western Powers may neutralize the Russian threat, but the attempt at peaceful penetration will go on. War or no war, the real danger remains and will remain for some time. It is the danger of Communism. In an illuminating letter to *The Times* published on 12th June, 1948, Lord Astor gave a valuable analysis of what Communism is and how it threatens the free democracies, with an equally valuable analysis of free democracy.

"Communism," writes Lord Astor, "is based on materialism, atheism and dictatorship (including the use of force and duplicity to reach its goal). Communism requires the monopoly of power in a single party, the control of opinion and news, which results in compulsory ignorance, a secret police which backs the regime by terror through concentration camps, forced labour. Communism also predicates atheism—the only Church in Russia is as much a part of Stalin's propaganda machinery as is the Soviet Press, and people are deprived of the exercise of their conscience aided by inspiration, revelation and reason. Communism may . . . exist in one-fifth of the world, but it has not been adopted voluntarily nor retained anywhere by free public vote after honest discussion.

"Communism today menaces the world, because a small band of determined men have obtained control of the vast resources of man power, finance and material of the countries they have enslaved; because it exercises mass mesmerism through specious lying propaganda, able to stir up war frenzy behind the iron curtain and carry on wars of nerves outside; because through fifth-column infiltration it creates discord and discontent among the thoughtless and ignorant, as well as among the backward and native populations. Communism promises social security, but its acceptance involves mental and moral slavery, which reduces humanity to the level of animals or robots."

Free Democracy

"What then are our alternatives? What the essentials of our way of life? First, political liberty, which includes universal education; general franchise; secret ballot; no one party monopoly; freedom of expression by speech, writing and radio; full access to news and to the opinions of others. This form of government allows of experiments, in taxation and in the amount and method of public control over production and distribution—it permits of reversal and change and places ultimate responsibility for decisions on the electorate. Secondly, justice (Habeas Corpus—trial by jury). Thirdly, freedom for all religions.

"Free democracies must also be ready to defend themselves. Peace is never a willing gift from bullies to weak neighbours. The strong should also . . . be prepared to give active aid to smaller brothers.

"The above type of State has passed the experimental stage successfully in Scandinavia, Switzerland, the Netherlands, the British Commonwealth, and the United States of America among others. These States are able to show a high and improving standard of living—above all, their people have been trained to have character through the development of individuality. . . ."

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New Technique of Aggression

On 10th June, two days before that letter was published, General Smuts gave his installation address as Chancellor of the University of Cambridge, in the course of which he examined what he called "this new technique of aggression."

"We do not realize," he said, "that we are in fact passing through one of the great secular revolutions of history, and that deeper forces are at work which—war or no war—may completely reshape our world, and are already in fact transforming our human scene."

The danger is all the greater because it is an insidious danger. War can be recognized for what it is, and material force can be opposed by material force; but the insidious danger of Communism must first be recognized and a new technique of defence devised to meet it. The problem is how to prevent Communism overrunning our Western civilization. "The overrunning of this civilization in the West and South and its assimilation to Soviet conditions would be an immeasurable calamity to our human future." It is high time we called a halt. We must say to Mr. Stalin and his colleagues of the Politburo and of the Supreme Soviet: "Thus far and no farther!" . . . "The great task before the world today is the salving of Europe, materially, politically and spiritually. Beside it all other tasks and problems shrink into comparative insignificance."

The present danger is not a new one, though its manifestation is new. We have met it before. It is an old villain tricked out in a new dress, and the dress is not without attraction to all who consider they have not been fairly treated by the society in which they live, and to certain intellectuals who are dissatisfied with present social circumstances. The danger is recognizable as "totalitarianism in its Communist form"; and just as much totalitarianism as Italian Fascism and German Nazism, both of which have been defeated by force of arms.

The present danger is the aggression of an idea. It must be countered by loyalty to another and better idea. This is aptly summed up by Scrutator in the following words: "The question to be decided within the next few years is whether Western Europe shall remain true to its own civilization and its own beliefs in liberty and justice, or shall succumb to the wave of despotism sweeping westward from Russia."

SIX-POWER AGREEMENT ON GERMANY

The establishment of a semi-autonomous State of Western Germany proceeds apace, facilitated by the somewhat unexpected but most welcome support of the German people in the Western zones. The basis for these negotiations is the Six-Power Agreement on Germany, which was the result of talks concluded in London on 1st June. The recommendations then agreed upon were officially announced on 7th June and published in the Press on the following day. They include provision for a constitutional government in Western Germany (*i.e.*, the British, American and French Zones), for an international authority to control the distribution of steel, coke and coal from the Ruhr, and for a common export policy.

(i) The constitution of Western Germany, which will be "a federal form of government which adequately protects the rights of the respective States," is to be framed by a Constituent Assembly convened by the Military Governors concerned and the Ministers President of the three Western zones. The Constituent Assembly is to meet in September. The constitution framed by it must first be approved by the Military Governors and must then be put to the German people in a referendum. Elections for the new Government (assuming that the constitution will be approved and accepted by the people) will probably take place in the spring of 1949.

(ii) In the international authority which is to control the output of steel, coke and coal from the Ruhr, "the vote will be exercised by those Powers which share the responsibility for the economic administration of that part of Germany which includes the Ruhr." These Powers will be: the United States, the United Kingdom and France, with three votes each; the Netherlands, Belgium and Luxembourg, with one vote each; and Germany.

(iii) Of the provisions for security (Part V) *The Times* Diplomatic Correspondent

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wrote (on 8th June, 1948): "On Security, the three delegations reiterate 'the firm view of their Governments' that there can be no general withdrawal of forces from Germany until the peace of Europe is secured and without prior consultation. This was as far as it was possible for the United States delegation to go towards giving the French a military guarantee against aggression from the East—such aggression would mean an encounter with United States troops and automatically involve the United States in war. There are very specific recommendations designed to prevent the resurgence of an aggressive Germany, and before the general withdrawal of the forces of occupation (at some distant date) an agreement is to be reached for the continued occupation of key areas of Germany. The French regard this as most important."

While the Governments of the United Kingdom and the United States are both willing to accept these proposals as now stated, the French Government have shown hesitation; but there is reason to believe that France too will eventually give them her whole-hearted support. France's attitude is understandable. She fears, and with reason, the resurgence of an aggressive Germany; but with the full military support of the United States as well as that of the United Kingdom, which will be guaranteed if these proposals are adopted, France will be assured of all the support she can hope for in any circumstances.

ITALY'S FORMER COLONIES

After three years of discussion the question of the disposal of Italy's former colonies in Africa, Libya (including Cyrenaica and Tripolitania), Eritrea and Italian Somaliland, is virtually back again where it was in 1945, with the U.S.S.R. representative now proposing a joint United Nations trusteeship for all of them, which proposal was first made by the U.S.A. in 1945, opposed by the U.S.S.R. and later withdrawn by the proposer.

The question is now to be referred to the General Assembly of the United Nations at the sitting which opens on 21st September.

From the point of view of the British Empire, Libya is the most important of these lands, for its strategic value. The safety of imperial communications through the Mediterranean depends to a great extent on this long stretch of North African coastal territory being controlled by a member of the British Commonwealth, or at least by a Power whose friendship can be implicitly relied upon. Aircraft based there could protect all friendly sea traffic in the Eastern Mediterranean and make the route almost impossible for hostile traffic. For these reasons we cannot afford to allow the Italians to be placed again in control, still less the U.S.S.R.

There is also another reason why we are interested in Libya. Its eastern part, Cyrenaica, is occupied largely by the Senussi; and early in the war the British Government gave a solemn promise to Emir Sayyid Idris el Senussi, their chief, that he and his people would never again be subject to Italian rule if we could prevent it. This moral obligation rests upon us, and it happily accords with our strategic requirements.

The question of Eritrea's fate is complicated by the fact that through its principal port, Massawa, passes most of Ethiopia's sea-borne trade. For that reason, Ethiopia should have some guaranteed rights in the port and over the whole of the railway which connects it with Addis Ababa. One way of ensuring this would be to put Eritrea under the trusteeship of Ethiopia, or under that of the United Nations with Ethiopia as the agent.

What used to be Italian Somaliland might be placed under Italian trusteeship. Agreement to that effect was nearly reached at the Conference of Foreign Ministers' Deputies. Its port, Mogadishu, is apparently little used by Ethiopia; and, provided that Somaliland is not likely to be used for a third invasion of Ethiopia by Italy, there would probably be little objection from Addis Ababa.

Whatever the final decision, however, it is to be hoped that it will be made and announced soon, in order that the reconstruction and administration of these territories may proceed. There has been far too much delay already.

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COMMONWEALTH SOLIDARITY

The meeting of Commonwealth Prime Ministers under the chairmanship of Mr. Attlee, planned to take place on 11th October in London, gives official recognition and practical application to the widely felt need for more solidarity in the policies of the several members of the British Commonwealth.

Two world wars have shown that the Commonwealth and Empire are one in spirit, and this is not in question. But there is need for closer co-ordination in peace time, particularly in matters of foreign policy and defence, and in economic affairs as well. No doubt all these and many other subjects will be discussed at the forthcoming conference.

In this connection it is apposite to recall a powerful appeal for "A United Empire" by Mr. Robert Menzies, Leader of the Opposition in the Parliament of Australia, which appeared in the *Sunday Times* on 8th August, 1948. Mr. Menzies draws attention to two facts which must be obvious as soon as they are mentioned:

(i) "The British Empire's contribution to the winning of the war," he says, "remarkable and vital as it was, could not have been made without the closest intra-Empire co-operation under master schemes"; and

(ii) "Since the war ended we have had no Empire Conference, no real concerting of Empire policy on the higher levels, or even on the middle or low."

"By some curious aberration of the calendar," proceeds Mr. Menzies, "it has not been found possible to bring together in one place and at one time the representatives of the British nations to discuss what must be for us the most significant and important of all international questions: How can we, the British people, so think and decide and work together that we can make our most effective joint and several contribution to our own development and strength and therefore to the pacification and progress of the world?"

Among the topics suggested by Mr. Menzies for discussion at an Imperial Conference are:

"Empire military defence and strategy.
"The redistribution of Empire population.
"Empire foreign policy, particularly in relation to the peace settlements with Germany and Japan.
"Empire response to the threat of Imperialistic Communism.
"The Empire attitude towards the proposals for Western European Union.
"Empire trade and commerce in this new dollar world.
"Empire development of joint resources which, viewed as a whole, are as yet rich in unclaimed and unexplored assets."

Mr. Menzies also reminds us of what has for long been apparent, that only as a Commonwealth and Empire can the British peoples claim to be a great Power comparable with the United States of America and the Union of Socialist Soviet Republics. And apart from the need for solidarity if the British Commonwealth and Empire is to take its proper place as a great Power, the international situation demands that we shall speak with one voice on the fundamental questions that now confront international assemblies.

"I declare my conviction," Mr. Menzies concludes, "that a United British Empire voice and policy are needed today as perhaps never before. Without abandoning any of the rights of adult nationhood, let us face the truth that in our independence we are inter-dependent; that we shall, as always, do better as a team than as units."

By a significant coincidence, *The Times*, in a leading article on the following day, referring to the fact that Mr. St. Laurent, Secretary of State for External Affairs in Canada, had succeeded Mr. Mackenzie King as Leader of the Canadian Liberal Party, said: "Canada's associates in the British Commonwealth and beyond may view with unmixed gratification the prospect of Mr. St. Laurent's accession to the highest office. (*He will almost certainly be Premier of Canada.*) In a succession of remarkable speeches, and by his consistent policy at the Ministry of External Affairs, he has identified his country with the strategy of North Atlantic union, conceived as a plan of regional security within the frame of the United Nations. He seeks equally close

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relations with the United Kingdom and Western Europe, on the one hand, and with the United States, on the other, accepting for Canada her geographical role as a bridge between the two, with a special part to play in the front line of any conflict in this rocket age across Arctic regions. He can count on being accepted as the exponent of what the neighbouring republic calls a bi-partisan foreign policy."

Though not quite the same thing as what Mr. Menzies was then advocating, it is complementary to it and in perfect harmony. The idea of a North Atlantic Union, comprising the two great English-speaking nations of the North American continent, the United Kingdom, and the democratic nation-states of Western Europe, is one which deserves the closest attention as a counterpoise to the weight of Russia and her satellites in the East. In combination with the rest of the British Commonwealth and Empire, it would present overwhelming political influence and military power in opposition to any other Power or possible combination of Powers.

But before this can become fully developed, as Mr. Menzies said, "we need a real Empire policy and we need it now."

A SUGGESTED PURPOSE FOR "THE R.A.F. QUARTERLY"

One serving officer, when offering his services to assist the Editor in any way likely to promote the cause of this journal, said: "I feel there is a real need for a forum in which officers of the Royal Air Force and Dominion Air Forces can put forward their ideas on air matters and in particular on general matters of war as seen through their eyes."

THE R.A.F. QUARTERLY provides just such an opportunity and the Editor hopes that both present and past officers will take full advantage of using it for this very excellent purpose.

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Some Reflections on Airborne Forces

By Air Chief Marshal Sir John C. Slessor, K.C.B., D.S.O., M.C.

(*Reprinted, by kind permission, from "The Army Quarterly," July*, 1948)

THE airborne forces of the Army won wide and well-earned fame in the late war. But I am not sure they have yet been the subject of all the clear and unemotional thinking they deserve if we are to progress on the right lines in this form of air/land warfare. I do not propose to attempt to do more in this article than to set out certain factors in the problem that I believe may have been obscured by the peculiar circumstances in which air transport support and supply achieved such striking results in the latter years of the war. The reader who wishes to know the story of the airborne assault in the Normandy landings, the splendid gamble of Arnhem and the crossing of the Rhine should consult the published despatches of the commanders concerned and Mr. Hilary Saunders's little book "By Air to Battle." Whatever may be the future of airborne forces, those battles will remain among the most glorious traditions of the Army and the Air Force. But, great though their influence was on the operations in North-West Europe, it was nothing like so decisive as was that of the air transport and supply in the Far Eastern theatre. Who, ten years ago, would ever have believed that within ten years whole brigades and their transport, 9,000 fighting men and 1,200 mules, with all supporting weapons and equipment, would be landed by air in an enemy's rear in the jungles of Burma? I don't think it would be seriously denied that the Burma campaign just could not have been fought without the old Dakota. While the American air supply operations over the "Hump" to the Chinese Army and to Chennault's little air force were one of the great air epics of the Second World War.

But our policy for airborne forces and supply in the future must be based on something more solid and prosaic than a glorious and romantic tradition. The whole picture must be viewed in its proper perspective—with imagination and vision, but at the same time dispassionately and objectively. We must not be carried away by the vision of what we should like to do—how we should like to solve some of the Army's modern problems by the use of air transport and supply; we must face up squarely to what in actual practice we are likely to be *able* to do and what it will cost us to do it. That means facing, honestly and without emotion, the realities of the conditions in which air transport support and air supply was used so effectively last time, and of its cost in British and American effort in the years 1940 to 1945. I hope I may not be misunderstood or suspected of underrating the great and gallant services of the airborne divisions of the Army and the air transport groups of the R.A.F. when I suggest that, from the earliest days of British airborne activities in 1940, our policy in this respect was conditioned too much by emotion and too little by reason.

I happened to be closely associated with the earliest beginnings of airborne forces in this country when I was serving as Director of Plans in the Air Ministry, and I very well remember the day in June, 1940, when we received one of Mr. Churchill's characteristic minutes: "Let there be at least 5,000 parachute troops. Pray let me know what is being done"—or about the same number of words to that general effect, crowned with the well-known tab "Action this day." The Prime Minister, whose indomitable offensive spirit, often quite regardless of practical realities, was such a tonic to everyone who had to deal with him in those bleak days, had been deeply impressed (as indeed were most of us at the time) by the bold brutality of the airborne landings in the Norwegian campaign, when Ju.52's full of storm troops poured into Fornebu, by the parachute descents on The Hague in the invasion of Holland, the crash-landings on the beach at Scheveningen and the glider-borne capture of Fort Eben Emmael. If Mr. Churchill had allowed himself to be influenced too much at that time by the squalid

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facts of life—ways and means and considerations of strategic priority—we might perhaps have lost the war. The Air Staff, on the other hand, were paid to think of these things and—while I claim no special prescience on their part—two considerations were very prominent in their minds. First, it had not escaped them that these very successful enemy airborne operations (as the later ones against the Corinth Canal, in Crete and in Java) were undertaken against weak or negligible opposition from the ground and in conditions of absolute air supremacy. They believed, as they still believe, virtually complete air superiority to be an essential prerequisite to the successful conduct of airborne operations and so may perhaps be excused for failing, in the circumstances prevailing at the time, to share the Prime Minister's sense of the urgency of the immediate initiation of an airborne force. Secondly, the Air Planners, in collaboration with their colleagues of the Army and Navy, were then engaged in an examination on behalf of the Chiefs of Staff of our future strategy following the fall of France—in the preparation of what I always think of as the "What does A do now?" paper. Remember the background of that examination: Britain, with her Army disarmed, alone against Germany and Italy; the war effort of the Dominions as yet undeveloped; Russia neutral but a partner in a pact with our enemies; no tangible prospect of American intervention on our side; and Gibraltar, the gateway to the Mediterranean, at the mercy of a very uncertainly neutral Spain. There seemed every prospect of England being invaded before the autumn—the Battle of Britain was yet to be won—and, with the Continent in the grip of the Axis, the planners came to the not unnatural conclusion that our hope lay in securing our island base and sea communications, while developing to the full the only means we had in the foreseeable future of striking at the enemy, namely economic pressure and the bomber offensive. Of these, the value of the first was, to put it mildly, extremely problematical, while for the second our resources at the time were almost ludicrously inadequate.

Nevertheless, in spite of this situation, the Prime Minister's instructions were obeyed, personnel and aircraft were made available and the Parachute Training School was opened at Ringway. But it may perhaps be understood why the Air Staff at that time did not fling themselves into the development of air transport support with quite that single-minded enthusiasm that its early protagonists expected of them. *The first thing we had to do was to win the air war.* And to do that meant not only expanding Fighter Command and repairing the ravages in our fighter force occasioned by the defeat in France, but also steadily setting ourselves to build up Bomber Command from its then almost negligible strength. In the summer of 1940 there was not the remotest prospect of our being in a position to undertake airborne operations in the then foreseeable future—actually it was three years later that the first airborne assault on a serious scale was staged in the invasion of Sicily. We could, and did, start training parachute troops, adapting such aircraft as could be made available and developing the technique. But in the second quarter of 1940 our monthly average production of twin-engined aircraft in this country (including the obsolete Whitley and Blenheim) was 288, of four-engined aircraft *one only*; and we had no American supplies (our corresponding figures four years later were 476 and 460, and we had secured thousands of twin-engined aircraft, including the invaluable Dakotas, under Lend-Lease from the United States). It will be obvious, therefore, that while we could begin the training of Mr. Churchill's 5,000 parachutists, there was no prospect whatever of being able to produce the aircraft or crews to drop them in action, tug them in gliders and supply them by air within a period to be measured not in months but in years. The Chiefs of Staff and the Prime Minister endorsed the conclusions of the Joint Planners referred to above; our aircraft industry was geared to the big heavy-bomber programme which made possible the development of Bomber Command as it was in 1944-45; and in the autumn we turned to the "Arsenal of Democracy" to supplement our own industry by the production of more bombers and of the transport aircraft for which we had no capacity in England. The Air Staff of the day had many shortcomings, but they were deeply imbued with a sense of the vital importance of two principles: the need to achieve air superiority before any other operations by land or sea could have a chance of success; and the need to concentrate the greatest available effort on the task which, in the circumstances of the day, alone held out a prospect, however distant, of decisive effect—and that, by common agreement at the time, was the bomber offensive. The knowledge that the second course was an essential factor in the success of the first led the Air Staff to set their faces against the diversion of striking power to any purpose other than one which threatened temporarily to be decisive *against us*—such as the menace of the U-boat or the threat to Egypt in 1942. When one is on the strategic defensive, as we were till the end of 1942, it is sometimes essential to divert potential offensive capacity to defensive purposes, to stave off disaster. Fortunately by the beginning of 1943 the whole picture had changed: Hitler

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had launched his fatal gamble against Russia; American forces had joined us in the field; American production was getting into its stride; and between them the Allies were legitimately able to allocate increasing resources to the development of air transport support and supply.

I set out these facts at some length not to make excuses for the Air Staff of those days—indeed, I believe they need no defence, but were absolutely right in the policy to which they adhered so resolutely in difficult times—but to emphasize two points which I think must be understood and accepted if our future policy for airborne forces is to be based on sound foundations.

The first point is that neither the operation of airborne forces nor supply by air on a serious scale will be practicable except in conditions of virtually complete air superiority. It was by no curious chance that the Germans never undertook an airborne operation after the capture of Crete—where they had the air to themselves. To the end of the war they had their so-called parachute divisions, but never, either in North Africa, in Italy or in North-West Europe, were they used again for the purpose for which they were designed. Their well-known 22nd Division defended the beaches of Crete against an invasion which we never seriously contemplated; Ramke's picked parachute brigade was used as ordinary infantry in the desert; the picked men of the paratroop divisions fought stubbornly on the ground in the defence of Cassino and in the Low Countries; but never (if one excepts the fiasco of Heydt's single ill-fated battalion during the Ardennes offensive) were they dropped from the air. The reason is plain. The enemy recognized, as we had recognized earlier, that airborne operations against an enemy unbeaten in the air are a spectacular and expensive form of mass suicide—a truth that was sharply underlined by the slaughter of the Me.323 powered gliders, full of reinforcements, by the British and American fighters of the Desert Air Force just before the capture of Tunis.

Secondly, the great Allied airborne operations of 1944 did not take place till the middle of the fifth year of war, when the whole industry of Britain and America was fully mobilized. At the time of the Normandy landings the production or multi-engined aircraft in America and this country averaged over 3,600 a month. At the time of the crossing of the Rhine there were something of the order of 1,800 troop-carrier and transport aircraft and glider tugs available to the Allied forces in Germany. I do not pretend to have attempted even a rough estimate of the total cost of airborne forces by the end of the war—of the transport aircraft, gliders, training aircraft, crews, R.A.F. ground personnel both in first-line and training units, of the airborne units of the Army and their mass of specialized equipment and stores. But I believe it to be no exaggeration to say that, compared to that cost, the much-publicized £500 million spent on the atom bomb would not appear a very formidable figure. Whether all that expenditure of national effort here and in America was justified by results or whether equivalent or greater dividends might not have resulted from its investment in other forms of force I would not care to have to say—the curious thing is that, as far as I know, no such objective appreciation has ever been made.

But, anyway, that is not the relevant point today. What we should now be considering in the light of past history is this: on the assumption—the perhaps somewhat improbable assumption—that a major war on anything akin to traditional lines is a contingency to be seriously reckoned with in the future, is there really any reasonable possibility of airborne operations and air supply on a serious scale in, say, the first two years after the outbreak? Bearing in mind always that air superiority, other than of a purely local and very precarious nature, is a long-term investment—the outcome of what I have called the unseen campaign against the enemy's vitals—is there really any chance of us and our Allies achieving within two years that degree of air supremacy required for the operation of great fleets of troop carriers and supply aircraft? And, finally, is there any prospect of ourselves and our Allies being able to produce within that period—in addition to our fighters and the aircraft that must wage the unseen war—those great fleets of aircraft, their skilled crews and trained maintenance personnel and the enormous training organization required to back them?

I cannot bring myself to believe that these things are within the bounds of practical possibility.

That clearly does not mean that we should drop airborne forces like a hot brick. If we were ever to find ourselves again let in for a prolonged world war we must be in a position to undertake airborne operations and supply by air of armoured forces as soon as the air situation and the production situation permits, and we could not do that even in two years or three unless we "keep the art alive." We must go ahead with research and with technical and tactical development. We must keep abreast of the times and develop a sound basis of training and tactics, both of airborne troops and the aircraft that carry them; we must design, prototype and test the aircraft and equipment that will be needed and must see to it that, so far as is commercially possible, the design of civil aircraft incorporates such features as may be

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necessary to make them easily adaptable to the military transport and supply role. In doing that, however, we must be realistic. It is just no use discussing today the provision of military aircraft and gliders to carry, for instance, 30-ton tanks. Technically it would not be impossible to design and build them; but practically it would not make sense. Just as at sea we have in war to rely in the main on the ordinary merchant ship for the transport of troops and equipment, so in the air. That marvellous military transport the Dakota was designed and built as a commercial aeroplane before the war, and it forms the bulk of the commercial fleets on the airlines of the world today. So it will be in the future. If we imagine that either in peace or in war we shall be able to afford to build up in the R.A.F. a fleet of specialized military transports capable of carrying each and every load that the soldier would like to see carried, or that we shall be able to persuade commercial operators to use aircraft primarily designed to carry these miliary loads, we are living in a fool's paradise.

So it seems to me that the basis of our policy for airborne forces in peace should be research and development aimed at operations on a major scale, and the maintenance of small but highly specialized and trained airborne units for small-scale sabotage activities, which I think would be practicable and might have invaluable effect in the early stages of a war. It may be also that we can achieve real economies with added efficiency in police and occupational duties in peace by concentrating our garrisons and using air transport to get them to wherever they may be required quickly. That means that all Army units with their first-line transport and supporting weapons must be air transportable and we must retain in the R.A.F. enough transport squadrons to provide some air mobility in an emergency to the Army as well as to ourselves. I do not believe we can do more. I do not think we can afford, in these impoverished days, the man power, the material or the money to maintain in peace airborne divisions with all their mass of specialized equipment, or the enormous numbers of aircraft required to lift them.

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DISCIPLINE AND DEMOCRACY

A Paper considering the value of Service Discipline in the light of Modern War and Social Progress

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PART I

DISCIPLINE THROUGH THE AGES

DEFINITIONS of discipline will vary widely in accordance with the position and outlook of a man. To a soldier in the ranks it may mean drill and unquestioning obedience to his seniors, enforced by punishment. To a higher commander it may mean broadly a system for ensuring the co-ordination of the effort of his officers and troops in the execution of his plans. But there are other connotations, which include the abstract notion of discipline as a quality of the mind comparable to that of will-power. The word "disciple" evokes the notion of loyal obedience to a doctrine, while "discere," to learn, suggests a method of instruction. The discipline of a unit is commonly said to be good or bad in accordance with the standard of drill and the precision with which its duties are performed, or the smartness of its dress. There are, doubtless, not a few in whose minds discipline is synonymous with irksome parades and the monotonous repetition of punishment.

In the Services, especially in peace time, discipline is apt to be thought of as an administrative requirement to ensure smartness of dress, punctilious saluting and the subordination of juniors to their superiors. Officers of this opinion would no doubt draw a distinction between discipline and morale, for they would argue that it is morale which inspires the fighting man to face the odds of battle. Here we might ask whether morale contributes to discipline or discipline to morale, or indeed can they be separated from each other? Lord Montgomery has said: "The aim of discipline is the conquest of fear." Thus discipline appears to be elevated to a quality within which the element of morale is an important contribution. Indeed, it is interesting to note that the term "morale" has been coined only in comparatively recent times, and was rarely used by the ancients. For them the term "discipline" was adequate.

For the purpose of this paper discipline is conceived as a quality which is inseparable from the conscience of the man. It is the product of such characteristics as skill, which promotes self-confidence, loyalty, which promotes the instinct of self-sacrifice, and of physical and mental training, which promotes precision of mind and movement. It staunches his capacity to make himself do something under the impulsion of duty which he would not otherwise do. It involves the willing obedience and intelligent interpretation of orders. It develops his powers of endurance in the face of fatigue, ill-fortune and fear. It allows for the co-ordination of his efforts with those of his fellows to develop the maximum fighting efficiency in the achievement of the commander's aim. Considered in its widest sense, the fountains of discipline spring from the deepest influences in a man's life and origin. And from deeper still, these waters have seeped up from the philosophies of the ages and from elemental human characteristics.

From time to time the precepts of military discipline are challenged, on the general grounds that military discipline is a bondage which is unnecessary in the changed nature of war, and that it is opposed to the liberal notions of human dignity and freedom. No one can deny that changes have taken place in the methods of waging war. No one can deny that there have been social advances. Any inquiry into the nature of these changes and the methods of reconciling the demands of the portentious forms of war which civilization has inflicted upon itself with the ideals which civilization sets for the individual can hardly be complete without a review of the nature and purpose of discipline through the ages and an understanding of the deeper sources of human relations and behaviour.

Historical Review

Since the days when two men first went hunting together it was plain that their efforts had to be co-ordinated if their skill was to be combined to its best purpose. Without law there is chaos. Without order amongst men there is a rabble.

The Greek Phalanx is a comparatively recent example of systematic war, although it is amongst the earliest examples of which we have reliable accounts. The hoplite had little to do other than to keep his position in the phalanx and strike the

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enemy when he came within range. The most elementary form of discipline was required to train him to take his place in the ranks. He had learnt to wield a spear from the time he was a child. He knew that he was fighting in the ranks of an army which was defending his home. He knew that if he failed to keep his file he would be lashed or even condemned to death. His discipline was based on a narrow but firm foundation and from it grew a code of honour which prompted acts of heroism that are still fresh and gleaming in the pages of Grecian history. The Spartan discipline and the Laconic temperament are still bywords to this day.

The tradition of mechanical discipline has been adopted by Prussia in more recent years. Frederick the Great was brought up by his father with extreme rigour in the hope that he would become a hardy soldier and "acquire thrift with frugality." As a boy he rebelled against the harsh treatment of his father, but as a commander he laid the greatest store upon the most precise discipline. "Obedience to the officers and subordination is so exact that no one ever questions an order, hours are observed exactly, and however little a general knows how to make himself obeyed, he is always sure to be. No one ever reasons about the possibility of an enterprise and, finally, it is never despaired of." The Prussian military system became famous. It is a ruthless discipline. "The Prussians are superior to their enemies in constancy since the officers, who have no other profession nor other fortune to hope from except their arms, animate themselves with an ambition and a gallantry beyond all test, because the soldier has confidence in himself, and because he makes it a point of honour never to give way." Nevertheless, he laughed at the excessive admiration which foreigners expressed at his Potsdam parades, for he knew that it was not the drill itself that mattered but the superb tactical qualities which he acquired from the endless repetition of drills . . . the speed of fire was doubled, even in a confused battle his troops maintained more precise order than the best that the enemy could do, and the most difficult manœuvres could be performed at great speed without losing files or distances. It was a discipline enforced by the lash.

The Prussian tradition has survived the centuries to be expounded once again by its latest exponent, Adolf Hitler: "It is not necessary for the individual fighter to have a full grasp of the ultimate ideas and plans of the leaders. Victory will fall to the side which has the best disciplined, most blindly obedient soldiers." Doubtless we would not have far to look to find contemporary examples of that form of discipline which sets human life and livelihood at low worth.

The oldest military treatise in the world, "The Art of War," was written by Sun Tzu in 500 B.C. He contends that war is governed by five constant factors:

(*a*) The Moral Law (or conviction in the cause).

(*b*) Heaven (or the seasons, weather, night or day).

(*c*) Earth (or distances, contours, and the chances of life and death).

(*d*) The Commander (who stands for the virtues of wisdom, courage, sincerity, benevolence and strictness).

(*e*) Method and Discipline (or the marshalling of armies, the gradation of ranks of officers, road making and expenditure).

It is interesting as being the earliest known mention of the moral issues, and it is placed first amongst the factors affecting the art of war. However, Sun Tzu regards discipline as a totally separate factor, which has not yet been permeated with that moral quality which is an intrinsic part of the most recent precepts of discipline.

In his "De Re Militari," Vegetius comments: ". . . the Romans owed the conquest of the world to no other cause than continual military training, exact observance of discipline in their camps, and unwearied cultivation of the other arts of war." Here he certainly takes the narrow view of discipline to describe the constant alertness necessary and the measures enforced to avoid the dissipation of the soldier's energy in loose living. But amongst his sayings we find: "Few men are born brave; many become so through training and force of discipline." This comes close to the definition of the aim as "the conquest of fear." Referring to the formidable fighting nations which have become subject to the Romans, he says in a significant passage: "But the security established by long peace has altered their dispositions, drawn them off from military to civil pursuits, and infused into them a love of idleness and ease. Hence a relaxation of military discipline insensibly ensued, then a neglect of it, and it sank at last into entire oblivion." The Romans had become thus affected after the Second Punic War until: "At last, after the defeat of many consuls and the loss of many officers and armies, they were convinced that the revival of discipline was the only road to victory. . . ." And he discusses the development of the military spirit: "The courage of a soldier is heightened by his knowledge of his profession, and he only wants an opportunity to execute what he is convinced he has been perfectly taught. A handful of men, inured to war, proceed to certain victory, while on the contrary numerous armies

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of raw and undisciplined troops are but multitudes of men dragged to slaughter."

One of the factors which allowed the Romans to build up their armed strength was the conversion of the Roman militia into a professional army. Before 400 B.C. the militia consisted of the better-class Roman citizens who formed an amateur army which was available only during the summer months. Once Rome possessed a professional army discipline could be infused into it, and well might it be said that the ancients preferred discipline to numbers. Similarly, in the Middle Ages, military discipline was eclipsed by the feudal system. When, for instance, William the Conqueror crossed to England, he could not call upon his feudal army, for they were bound to serve for only forty days. Thus he was forced to rely upon volunteers and mercenaries. He held out promise of great riches and lands to the Norman knights. It was not a system which encouraged the best discipline.

Indeed, a good example of the superiority of small and well-disciplined bodies of infantry, armed with bows, over the undisciplined masses of mail-clad cavalry of feudal France was shown at the Battle of Agincourt. Henry V, who has been called "the first modern general," defeated what Trevelyan refers to as "the idiotic feudal array of Crécy and Poitiers" once again. If we are to rely upon Shakespeare as an historian, we can hardly believe that the discipline in the English army was of the Prussian pattern. It appeared to contain the elements of that moral quality which is a more familiar notion today:

"He which hath no stomach to this fight
Let him depart; his passport shall be made
And crowns for convoy put into his purse."

From the beginnings of English sea power there have been far deeper influences at work to maintain and nurture the discipline of the navy than the mechanical discipline of the phalanx or Prussia. After quelling the insubordination of certain gentleman adventurers on his voyage round the world, Drake laid down a golden rule to "prevent stomaching between the gentlemen and the sailors": "I must have the gentlemen to hale and draw with the mariners." Discipline in the Spanish and English ships reveals an illuminating contrast. While the Spaniards had slaves to work their ships, a very different state of affairs pertained in the English ships. "Private enterprise, individual initiative and a good humoured equality of classes were on the increase in the defeudalized England of the Renaissance and Reformation, and were strongest amongst the commercial and maritime population. The most energetic spirits of the gentry, the middle and lower classes were taking to the sea together in a rough camaraderie, for purposes of war and of commerce. In Spain the ideas and manners of society were still feudal, though in politics the King had become absolute. Discipline, as Drake well knew, is needed on board ship, but not feudalism and class pride."

The moral element counted for much amongst Cromwell's Ironsides. They were "men as had the fear of God before them, and made some conscience of what they did." This inspiration in the rightness of a cause is, of course, the most powerful stimulant to soldiers in battle, and of itself it affords a measure of cohesion amongst armies which have not been subjected to formal discipline. One might select instances such as the Gauls, the Ancient Britons and, in more recent times, the Sudanese who fought against Kitchener with all the zeal of religious inspiration. However, under a system of Roman discipline the raw material of the warlike nations whom they conquered became the incomparable armies of the most powerful military empire of that era. In the same way we find that under a system of British discipline the warlike races of India have become some of the finest infantry of recent times.

It is a little surprising to read of Marlborough: "He does not know much of discipline, and gives too much rein to his men, who have now and then indulged in frightful excesses." Here is the most successful commander of his day, who never fought a battle he did not win nor besieged a fortress he did not take. On the field of battle his troops were renowned throughout Europe for their discipline and superlative fighting qualities.

Napoleon was famed for the "moral touch" which he introduced into his generalship, but it is clear from certain of the few writings which he left behind him that he aimed to exclude the ephemeral stimulants to morale which have tended to be thrown into relief in modern times. He was a hard taskmaster. "The first quality of a soldier is constancy in enduring fatigue and hardship. Courage is only the second. Poverty, privation and want are the school of the good soldier." He does not agree with Vegetius in placing "moral," or the conviction in the cause, as the first sinew of victory. "A good general, good officers, commissioned and non-commissioned, good organization, good instruction and strict discipline make good troops independently of the cause for which they are fighting. But enthusiasm, love of country, and the desire of contributing to the national glory may also animate young troops with advantage."

In 1804 Robert Jackson published a book entitled "A Systematic View of the Formation, Discipline and Economy of Armies." He had been at one time Inspector-General of Army

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Hospitals, and his work was almost certainly known to Sir John Moore. Jackson drew a distinction between "artificial" and "natural" training. The first was founded on the discipline of the phalanx in which the main emphasis was laid upon mechanical manœuvring. The second was of the Roman type, founded upon the "knowledge of man's capacities, physical and moral." He says: "The Roman soldier was formidable mechanically from knowledge of the use of arms abstractedly." He stressed the need for character and aptitude in the individual and believed in morale so that the soldier might be brought to withstand the nervous strain of war. He saw that the real enemy on the battlefield was fear. The object of the commander was to "produce united action of bodily power and sympathy of mental affections." Later he states: "Human action acknowledges two general motives as its source, namely, love or desire, fear or aversion." He dwells on the importance of habit. It cannot be acquired without constant repetition, and until it is formed "we cannot depend on the soldier as acting correctly under the various forms in which the enemy's force presents itself." These are the elements of discipline, but he rejects the notion that the fear of retribution can instil artificial discipline in place of natural discipline. "The impression of fear on the human mind degrades the dignity of man's nature, and extinguishes all that is noble in his character." He is disgusted by the Prussian school and states: ". . . there is not an instance in a thousand that the cat-o'-nine-tails has made a soldier what he ought to be; there are thousands where it has rendered those who were forgetful and careless, rather than vicious, insensible to honour and abandoned to crime." In place of fear and punishment he proposed to employ honour, discipline, confidence and skill.

Sir John Moore's ideas were very similar. Discipline, and not drill, was the basis of his work; discipline of a moral order, rather than of that type which has for its goal the creation of implicit and blind obedience. He writes: ". . . though drill was an important part of the instruction . . . it was the internal and moral system, the constant superintendence of the officers, the real government and responsibility of the captains, which carried the discipline to such perfection." The regulations which he drew up for the Rifle Corps state: ". . . real discipline implies obedience and respect wherever it is due on the one hand, and on the other a just but energetic use of command and responsibility." And, again: "Respect to superiors is the very essence of discipline. . . ." As means of fostering discipline he emphasizes regular hours and strict execution of duties, smart dress, maintenance of the customs of the regiment, and the study of the individual. For he believed that discipline of the mind was far more efficacious than the discipline of the body . . . in "natural" as opposed to "artificial" discipline.

From this historical review of discipline we see that the precepts of discipline have varied through the ages, in different countries and in particular as notions in the minds of commanders. There is the view that the aim of discipline was to make a machine of a man. There is the view that this is not enough, and that the machine must be animated by moral considerations. There is the view that moral considerations predominate and that they of themselves are the essence of discipline. But whatever the view of discipline may be, the ulterior purpose is to combine and co-ordinate the physical and moral energies of men in the pursuit of a common aim. Clausewitz has referred to the "union of forces in time and space." More recently Marshal Foch has coined the phrase the "working of masses tending to some common action." Indeed, he quotes Xenophon's maxim: "The art of war is the art of keeping one's freedom of action." And Foch expands this notion by saying that discipline implies an "understanding" and "combining" which in effect constitute obedience. He demands that discipline should be "intelligent and active" which is reflected in the individual in "initiative." He believes that passive discipline such as used to be in favour under the absolute systems of the past must give way to active discipline. Discipline is something "inseparable from conscience." He continues: "To be disciplined does not mean that one only carries out an order received to such a point as appears to be convenient, fair, rational or possible. It means that one frankly adopts the thoughts and views of the superior in command, and that one uses all humanly practicable means in order to give him satisfaction." Indeed, the idea of active discipline stipulates that an order should set in motion ". . . mental activity so that the plan should be understood and endorsed: mental activity so that the physical means should be found in order to carry out that plan: mental activity to ensure that the plan is carried out in spite of the enemy's efforts to thwart it." Although Foch made these comments with reference to the discipline of commanders, it is certain that they apply in due degree to the recipients of orders at all levels. In days of old it was this element of mental activity which distinguished the officer from his troops. Today this is no longer the case. War demands a high degree of mental activity from all ranks. This simply emphasizes the importance of understanding the nature of war today, the quality of the recruit

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coming forward and the form of discipline which is required to reconcile the war and the man.

Perhaps we can best summarize the deductions to be drawn from this survey by concluding that there are two main concepts of discipline. Both aim to co-ordinate human effort in war. The one emphasizes unquestioning obedience and mechanical discipline. The other emphasizes understanding and initiative. Both contain the elements of the other but in differing degree. Both demand obedience, but the methods of obtaining it differ widely. It is the distinction between developing "natural" discipline and the necessity for imposing "artificial" discipline. It is the distinction between "active" and "passive" discipline—induced or enforced discipline. As a result, a definition of the term "discipline" can no longer be confined to the sense of the artificial, the passive or the enforced standards of behaviour or the methods of achieving it. Discipline now embraces the wider sense of the natural and active elements of the human make-up. It is, indeed, a quality of the mind—even, perhaps, the triumph of mind over matter.

PART II

INFLUENCES OF MODERN WAR AND SOCIETY ON DISCIPLINE

Origins of Discipline

In order to comprehend the motives which inspire natural discipline in men we must search amongst the instincts of man and the early influences upon his life. For this we may borrow from the science of jurisprudence and the Austinian theories of early society. For the purpose of defining the origin of law, he conceived the elemental society in human life to have been the family. The instincts of self-preservation and procreation brought families together to form tribes, and finally nations. Thus, too, in our search for the early influences which form the raw materials from which discipline may be moulded, we may profitably study the family.

When a child is born to a family it is helpless and wholly cared for by its parents. The natural instincts teach it to love and respect its mother and father. The environmental influences within the family will shape its character. Human beings are gregarious and imitative creatures, and the child will be influenced by the character and behaviour of its parents. In due course it will grow up and leave the care of its mother to be schooled by the father. In early days this consisted largely of learning the art of hunting animals for food, and the art of fighting in defence of the home. Finally, the child becomes a man and makes a home for himself.

The first influence is the care it receives. The instinct reciprocates by feelings of affection for and confidence in the parents. The second influence is the observation of the parents whereby he imitates their example. The third influence is the respect which the child develops for the father as head of the family, the protector, the provider and the judge. The fourth influence is the teaching in the arts of hunting and fighting which he learns from the knowledge of his father, who leads him on these expeditions. Finally, when he becomes a man, he is fit to become the head of his own family—a leader.

For the purpose of analysis the influences at work upon the child may be considered as mental, moral and physical. The mental influences are those which are perceived through the mind—learning to speak, to behave in accordance with the example of his father, to understand the affairs of the family and to direct his actions in its best interests. The moral influences are those which he feels in his heart and conscience—love, admiration, elation, hate, suspicion. The physical influences are those accomplishments which he learns by practice and experience—aiming his spear, running, fighting.

Clearly there are parallels to be drawn between the relationship between father and son and between the commander and his men. There are, however, certain points which should be thrown into relief. For instance, it is clear that the relationship is one essentially dependent upon mutual feelings and reciprocation—the care and instruction of the father are reciprocated by the affection and willingness of the son. The sense of duty outweighs the demand for rights. The son is a willing subordinate. The father would regard his discipline as good, for he learns with enthusiasm and obeys naturally. Thus we may conclude that discipline is a mutual affair resulting from the relationship of the leader and those who are to be led. The more closely its character to the relationship between father and son, the sounder the discipline. This constitutes the moral basis of discipline. If this is accepted, it seems clear that whatever attempts are made to instil discipline by mental and physical processes must fall far short of discipline based on moral qualities. In a service this moral quality will embrace loyalty to king and country, loyalty to the commander, team spirit, conviction in the rightness of the cause, religious conviction, and respect for the traditions of the country, the service and the unit, the sense of duty and the willingness to subordinate self to the common cause. It is the basis of good discipline and forms an integral part of the

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higher notion of discipline. It is, in fact, natural discipline. Discipline of this character can, therefore, be conceived as a relationship between the leaders and the led in which the reciprocal mental, moral and physical elements in our human make-up combine in a common understanding of the aim, for the attainment of which all desire to exert their supreme endeavours.

The State and the Man

Under this section it is proposed to deal with the nature of the influences which affect the qualities of the individual, and to inquire whether the influences of the present day tend to awaken or numb those qualities which are the source and life of discipline. Without embarking upon a lengthy philosophic treatise, it is necessary to take note of the main impulses behind our social progress and to relate them to the practical demands of our national security.

There has been no greater influence upon our social evolution than that of Christianity. Its philosophy permeates human relations within the family, between neighbours or strangers, between those in authority and those who serve. The wisdom of the Testaments inspires the laws which regulate our national society. Thus, even if a man's conscience is not formed by deliberate religious teaching from his early youth, it will be influenced indirectly by the precepts of Christianity through our laws and customs. Jesus taught that all men are equal before God. He also taught that servants must obey their masters. The essence of His philosophy was hope, faith and charity.

There have always been pagan gods, which have represented materialism and worldly gain. The high priests of these false gods maintain that to live in love and charity with one's neighbour is fine illusion, but that the natural state of man's relation with his creatures is one of strife. That is the Communist philosophy of our times. The appeal to self-interest and the acquisitive instincts of man is the common feature of materialist philosophies, and this form of paganism has reared its head many times through history to consume the peoples of the earth in anarchy, strife and poverty. We find in Communism the seeds of world revolution. It epitomizes its creed in the fight against capitalism, and enjoins the peoples of all nations to rise up against their leaders. Class is set against class, a less creditable manifestation of our temporal order, to undermine natural cohesion. The strategy and tactics of the revolution are carefully controlled by the autocratic rulers of the worldly power which will take advantage of the anarchy it hopes to induce, and pursue its purely materialistic ambition for power and riches. It is a doctrine which contains the elements of self-destruction in common with all other systems which trade by the weaknesses of the individual and whose inspiration is worldly ambition.

Hitherto, the world has been able to find no means of disseminating a philosophy throughout its length and breadth. Even the medium of the Roman tongue during the Early Christian era could not altogether supervene the authority and censorship of governments. The government of nations has been more or less absolute, and any doctrine tending to undermine the authority of a state has been easily suppressed. Christianity, on the other hand, was concerned with the behaviour of the individual. It was not an incitement to revolution, but, indeed, was rather an incitement to peace between all men, between master and servant, between all nations. It was, therefore, encouraged by the enlightened governments of nations as a source of strength and discipline. Today the powers of propaganda and the media through which it can be diffused have largely wrested from governments the power to control the thought of nations. Wireless, the Press, the cinema and the increased ease of movement throughout the world have contributed to a modern Babel, where the tongues of men may be understood but their "values" are not. Herein lies the opportunity for the false prophet to make capital of the rights of man.

It has been a slow process, and one to which there is no end, but throughout the history of our country we have built up a practical system of society, based, as we believe, on the rights of the individual and a conscientious interpretation of Christianity. The Magna Charta defined the rights of the Church, the feudal tenants, traders and of all classes of persons. The same spirit of justice and humanity imbued the Bill of Rights in 1689, and in our own time we find that spirit expressed in the Atlantic Charter. The attempt to synthesize the rights of the individual with the practical needs of a temporal society has given us the British constitution as we now know it. It has come under many stresses during the multifarious hazards of our history, but it survives as an institution and, more important, as a common and accepted precept in the hearts and minds of our people.

Just as poverty is the breeding ground of materialistic doctrines so also is ignorance. The material answer to Communism is plenty, and the moral answer is education. At one time we could afford to regulate the education of the masses in accordance with the financial convenience of the nation to provide it. Today the ideas of the world are thrown into a great boiling pot.

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The inability to discriminate renders the ignorant prey to insidious propaganda. Education has thus become a supreme factor in our national security. A little knowledge is never as dangerous as in the realm of ideas. "A little philosophy inclineth man's mind to atheism, but depth in philosophy bringeth men's minds about to religion." And so it is that we must aim at the highest standard of education for all, for, in the dawn of education, a man will question all about him—the authority of the father over the son, of the rich over the poor, of those set in authority over those who serve. The opening of the book of knowledge will increase the consciousness of a man and this will be expressed in self-assertion. His increased power to reason must be satisfied, or he will become the devotee of false gods. What he might have accepted tacitly he will criticize. Thus our institutions and our way of life are before him for his approval or disapproval. Only by absorbing the experience of men and affairs in the past can he make an equable judgment of the present. Only by equipping him to play his full part in our national life will he feel a proper responsibility towards the community as a whole. Only through the strength of knowledge will he be able to discern and resist the teachings of false prophets. His loyalties will be forged by his understanding.

With the increasing consciousness of the individual there must be, by the precepts of human right and justice, an increasing share of individual responsibility in the life of the nation. As in Service discipline or in the family, the commander or the father in the first place protects or provides for his charges. So in national affairs the first step is to ensure a just standard of living for all. The effect of these trends promotes a levelling of all classes by both educational and financial standards, although this may not be proportional to the responsibilities which the individual may have to bear. This raises the problem of the relationship between the leaders and the led, which plays such an all-important part in Service discipline. This is discussed after reviewing the nature of war and the demands which it makes upon men in modern times.

To sum up, therefore, we see that there is a great awakening in the social conscience of the individual. The simple faiths which governed the conduct of our soldiers and sailors in the past are inevitably assailed by insidious propaganda, and the sources of such propaganda cannot be excluded from reaching the individual in whatever position he may be in the country. The antidote is to educate the individual and so to increase his responsibility for our national existence and the just causes of our civilization. This in turn has brought with it problems to which we must adjust our Service system. It is concluded, however, that there is the opportunity for attaining greater cohesion within the nation, and consequently greater unanimity of purpose within our Services. The qualities which are the source and life of discipline are being increasingly awakened in the hearts and minds of men. It is for us to ensure that these greater means are best adapted to the needs of the Services.

War and the Man

In our historical review we have discussed discipline through the ages and have referred to the nature of the wars which prompted the development of that discipline. Here it is proposed to discuss how war of the present day has altered, and to inquire whether there is a need to adjust the type of discipline required in the Services on this account.

Originally parade-ground drill and battle drill were one and the same thing. This is no longer the case. Nevertheless, it is clearly necessary that men should behave in a calculable way in the face of incalculable circumstances. The nature of war today has imposed upon all Services the need for wide dispersion, and this makes greater demands upon the individual for independent action. For instance, the infantry soldier no longer fights in a phalanx or line formation, but is expected to show initiative and courage when he may have no officers to supervise or lead him within immediate sight.

The weapons which a man is expected to use efficiently are more complicated than they used to be, and a man must learn to be proficient in the use of many more than one weapon. It is the age of mechanization and every fighting man must be able to understand sufficient of the technical details of his weapon or vehicle to use it to the best advantage and to maintain it in the field. The intricacies of aircraft demand a high standard of education not only by those who must fight the battle but also by those who service them upon the ground.

The weapons of today are far more lethal than the weapons of yesterday, and the challenge which fear offers to every fighting man may be argued to be at least as great as, if not greater than, in wars of the past. The invention of weapons of mass destruction only lends point to this factor. Moreover, it is not only the fighting man who will be subjected to the rigours of war but also the civilian. This adds to the anxiety of the fighting man, who formerly knew that at least the safety of his family, the home country and his base was assured.

On the other hand, there are fewer men in the fighting line compared to those supporting them.

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whether they are on the lines of communication, in the dockyards, on the airfields or in the factories. This, however, implies that greater responsibilities fall upon the individual fighting man. In total wars in which the energies of all are concentrated in the war effort, he may therefore be considered to have become more of a champion of the nation in his fighting role. His training must be higher and his personal qualities must be of the very best. The time when war will be conducted by the remote control of rockets without the assistance of more conventional methods of war is not yet in sight except as a figment of the imagination, but in such a case the need for discipline will be uniform in all the nation—the discipline required of an industrial nation subjected to an air threat.

In the Air Force only a small proportion of its members actually go to battle. The majority of the serving personnel are involved in training and servicing the aircraft. The ground crews do very much the same job as workers in a factory. In fact, the division between what servicing shall be done in factories and what by Service men in the hangars is more or less arbitrary except in so far as requirements such as mobility are concerned. The precision of their work and efforts will have an immediate effect upon the operational ability of the unit, it is true, but this is only a matter of degree. Thus it might be argued that the form of discipline in factories is adequate for the ground crews of the Air Force. This would mean that there should be two standards of discipline in the narrow sense, one for the air crew and one for the ground crew. There would appear to be nothing illogical in this, and certainly a similar state of affairs is found in the Army. The discipline of a line regiment is certain to be very much better than the discipline of some administrative unit such as a base post office. On the other hand, whether a man is a cook or a gunner in the Navy, he must face the test of battle at his action station. Thus it would not be possible to draw any comparable distinctions between forms of discipline in a ship. This brings to mind, however, the case of the Merchant Marine, which is subject to severe test in war. It is clear that a necessary form of discipline should be maintained within it.

It may be argued that the standard of personal discipline demanded from administrative troops, such as ground crew in the Air Force, should not be required to differ from the standards of the community as a whole or their brother factory workers. What is more, any suggestion that factory workers should be drilled with the aim of instilling a measure of artificial discipline might be regarded as an imposition inconsistent with the liberty of the individual. Equally, however, it might be argued that in these days, when every civilian is "in the front line," it is now imperative that the whole nation should be subjected to a form of Service discipline.

To sum up, it is clear that the need for discipline throughout the nation in time of war is much increased by the ubiquity of the threat through the air. At the same time, there are elements in certain Services which do not require the same form of discipline as the fighting man. Meanwhile, the form of discipline required by the fighting man must allow for the highest degree of active discipline to meet the technical and tactical demands of modern war. These are such that natural discipline must be developed to the greatest possible extent, and the resort to enforced or artificial discipline is likely to be a secondary consideration, if not a counsel of despair.

PART III

LEADERSHIP AND DISCIPLINE

Leaders and Led

In past times leaders have been chosen either because they were the friends of the commander, or because they were born to a position of social leadership, or because they were in a position to purchase their commission, or because of their superior education and the type of society and school from which they were drawn. The qualifications for leadership were rank, financial independence, a background in which the natural attributes of leadership were developed, and a personality which commanded the respect and confidence of men. Today the process of levelling within our society, and the standardization of education have done much to eliminate any clear definition of a so-called "officer class," which until recently was synonymous with the middle class and the aristocracy. To what extent do we require leaders in modern war? What do we require of our leaders? What are the qualities which they must possess? How are they to be selected?

Owing to the complexity of modern war, there would appear to be an increased requirement for officers. Owing to the increased dispersion of warlike operations, both tactically and in their diversity, there would also appear to be an increased requirement for officers. Amongst these increased requirements the emphasis upon the characteristics of the officer may differ in accordance with his particular task. For instance, there is the fighting leader, who must possess the qualities of a tactician, the quality of a leader of men in the highest degree, fighting skill and intelligence. Then there is the staff officer who may not

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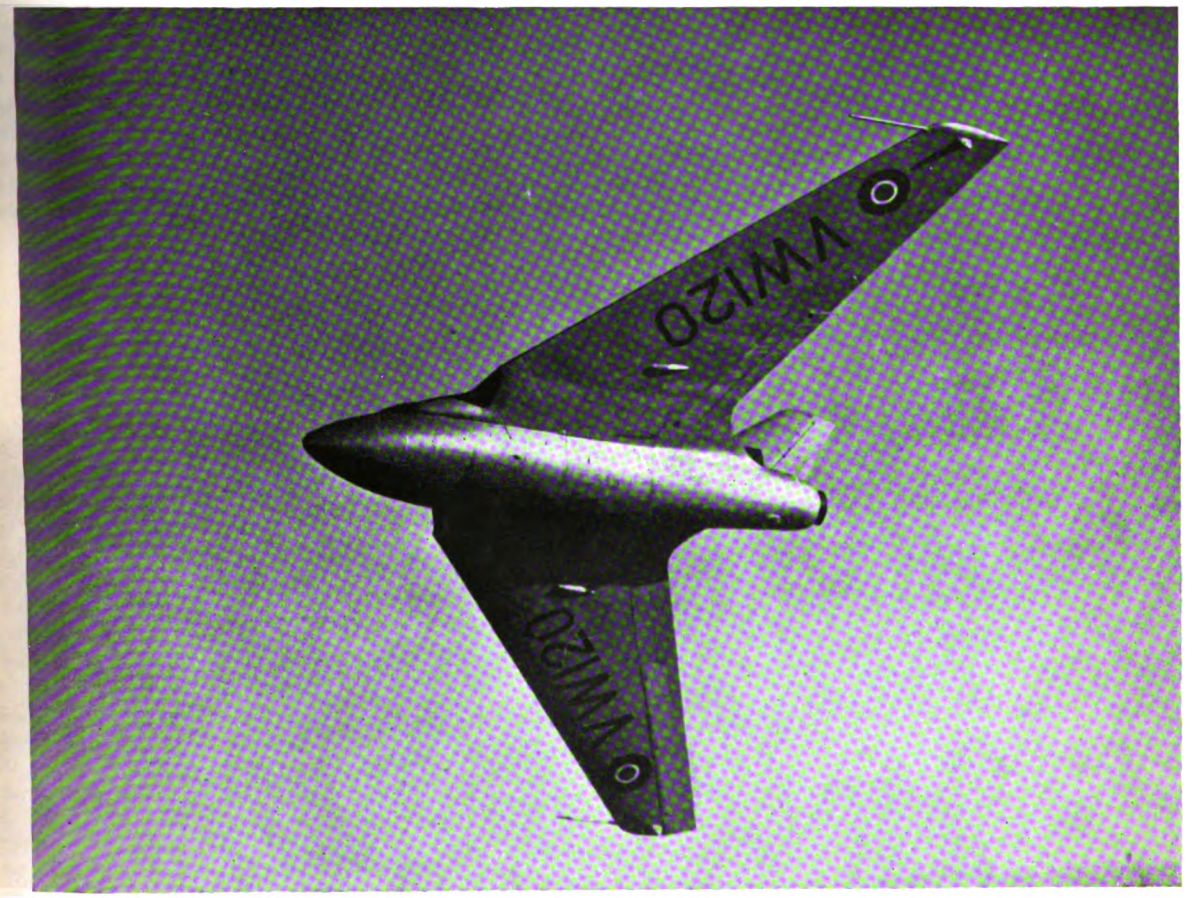

On 6th September a de Havilland D.H. 108 jet-propelled research aeroplane, piloted by Mr. John Derry, was flown at a speed greater than that of sound. The flight was part of a research programme in which the D.H. 108 has been flown at increasingly high Mach numbers.

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[*Photo by Gale & Polden Ltd.*

H.M. The King with H.M. The Queen and H.R.H. Princess Margaret on the occasion of their visit to the R.A.F. College, Cranwell, on the 6th July, 1948. His Majesty is accompanied by Air Commodore R. L. R. Atcherley, C.B.E., A.F.C., The Commandant.

(*See News Summary page* 246).

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command troops in battle but must organize and direct in support of the fighting units. Finally there is the technician who must direct the maintenance of fighting equipment. Indeed, it may be possible to find some officers who could meet all these requirements, but it is unlikely that a citizen army could be built up and trained on such a wide basis. On the other hand, it should be possible to find suitable officer material to fill these classes of positions separately.

The staff officer requires brains, and he must be industrious. He must be reliable to handle the secret material with which he will be dealing, and he must be painstaking to ensure that no avoidable error is made. The technical officer must possess a high technical knowledge and the ability to organize the work of others. In the Service he will be more than a works manager in that he will be responsible as an officer for the well-being as well as the technical work of the men under him. In the Air Force the mass of men will be under the command of a technical officer of one category or another. The type of leadership which is expected from him will lay emphasis upon man management, which is largely a question of his personality, initiative and training. On the other hand, the officer in a fighting unit will require the quality of leadership in a highly developed form, involving the highest integrity of character, personality, initiative, courage and endurance, and the capacity to command the confidence and respect of his men. In addition, he will require all the knowledge of a war leader, including a high degree of technical and tactical knowledge to meet the demands of modern methods of war. But the essence of his ability will lie in his qualities as a leader.

Today the authority of the fighting leader cannot depend on advantages which were denied to the men he leads. He may well have received his education with those same men. He is unlikely to enjoy the advantages of financial independence. He is unlikely to be born to a position of leadership. Therefore the respect which he commands from his men must be built upon the sure foundations of superior skill, superior knowledge, superior ability, superior character and courage, and superior personality. His prestige will be assisted only by holding superior rank and the proper acceptance of the formalities granted in respect to his rank. His authority will be increased in accordance with the example which he sets to his men and the courage and skill with which he leads them to battle. In every sense they must be leaders on their own merit. No longer can the shortcomings of the commander be made up for by the imposition of disciplinary measures. The tact and humanity with which he treats his troops will be the main criterion of the discipline in his unit. His resolution and purpose will set the tone of the discipline. Such men are to be found only amongst the highest calibre of men that the nation can produce.

It is probably true to say that by the end of their schooling the qualities of leadership will be sufficiently developed to distinguish those who will make good leaders. There are natural leaders, but leadership can and must be developed, tutored and polished. This process may take many years, and it is therefore important to select officer material at an early age. In all systems of selection errors can be made. Considerations of personality and character must far outweigh technical skill, although minimum standards must be laid down for this. The embryo qualities of leadership may take widely different forms, ranging from the self-evident to even the perverse, and it is only by observation under an experienced and mature eye that they can be detected. Whatever methods are adopted for the selection of officers when they enter a Service, it is essential that all commanding officers should foster the spirit of leadership amongst their subordinates and ensure that potential leaders are not wasted. This is an important factor in the morale of troops and in encouraging them to accept responsibility.

The most important single factor in the discipline of a unit is the character of the leadership. Without good leadership there cannot be good discipline. In the light of our modern social advances the factor of leadership is thrown sharply into relief. No trouble, care or national expense can be too great in the fostering of first-class fighting officers. Today they depend for their authority upon sheer merit, and all that can be done to support this prestige should be done without regard to cost—training, moral support, contentment and security. The corollary to this is the ruthless dismissal of those who have lost the confidence of their subordinates and their superiors. The selection of staff and technical officers is important, but the very essence of discipline amongst our fighting men is the quality of our fighting leaders.

We have discussed the leaders and now we turn to the led. We have mentioned the outstanding qualities of leadership which are required if the energies of better educated, more critical and more conscious members of our national society, who are to be the rankers in the Services, are to be animated and directed towards a single aim. We have shown that the nature of discipline is a quality derived from the relationship between the leaders and the led. What part are those who are led to play?

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Traditional discipline has relied upon a system of encouragement and punishment. The emphasis in disciplinary methods was to ensure that the soldier should be a good subordinate, and the assistance of artificial discipline was called in to enforce this restrictive discipline. The type of discipline was suited to the requirements of war and to the capacity of the soldier. Today the type of discipline required is certainly not restrictive, for the prime need is for individual initiative down to the lowest rank. Moreover, the capacity of the soldier today should certainly allow for a greater measure of natural discipline than has been possible in the past. Although the individual may not command troops, he must be considered wellnigh an independent fighting unit in himself. He must show no less initiative than was required of the junior officer in former times. It is therefore interesting to take note of some of the failings of junior officers in former times, and the reasons put forward by high authorities for them. In the Esher Report investigating the South African War, Major-General Sir Henry Colvile says: "The greatest fault of our officers lies in their want of initiative, and I believe this to be entirely the fault of their superiors. In an army which was largely officered from the ranks this would be excusable; the necessary discipline of the private must crush individuality, and a private risen to command can hardly be expected to shake off all the influence of his early training. But with a young man fresh from a public school it is just the contrary. He may be lazy and pleasure-seeking, but he is full of ideas; yet, should he venture to take any line of his own, say at a field-day, it is a certainty that before he has gone many yards every senior officer within range will be thundering at him, and, after a few such attempts, he gives it up and in time he becomes one of the thunderers. As long as there are men in command who have been brought up in this school, it will be very difficult to change the system. . . . It is far better that a young officer should make a few mistakes and learn their consequences for himself than that he should be so constantly nursed against the possibility of making one, that he becomes a mere puppet, unable to move unless a senior is by to pull the strings." This is a passage filled with significance. Major-General Baden-Powell says: "Junior officers should be given responsibility from their first entry into the Service. . . . The large majority of officers are keen enough and intelligent enough, but want to be given a real job in which to make their name and develop their professional interest. . . . Barrack-square drill and deadening routine should be reduced as much as possible. . . . With officers accustomed to work on their own responsibility, and with men using their own intelligence working under them, senior officers will be able with confidence to give their subordinates a free hand in carrying out their orders in co-operative movements . . . unhampered by the usual (and so often fatal) tugs on the check strings." Sir Ian Hamilton continues: "The previous practical peace training of Aldershot proved itself quite unsuited to the requirements of South African warfare. This training was calculated to stunt rather than to develop the initiative of company officers, section leaders and men." Lord Kitchener supported these contentions, and Lord Roberts added that artillery officers derived great advantage from being given more independence in command of units when still young.

How much more will these criticisms apply if we are guilty in the future of stunting initiative, when we have in the ranks highly educated men brimful of ideas and well able to reason for themselves! How much more would they apply when we are faced with techniques of war which demand an infinitely higher degree of independent action and individual initiative than ever before! Thus it is concluded that any discipline which tends to crush the individuality of the fighting man or stunt his initiative must be abolished. It would certainly be criminal to run the risk of killing the precious and often delicate quality of initiative in the fighting man by imposing a restrictive domestic discipline upon him to enforce his amenability to what peace-time administration deems to be a correct standard of subordination and behaviour. Fighting efficiency, skill at arms and the confidence derived from being master of his profession will inspire pride of unit and in consequence a high standard of domestic discipline. But no amount of domestic discipline of itself will make a fighting man, and it may very well run the grave risk of dulling his imagination and freezing his initiative for ever.

Leadership in War

Leadership is a term which is coined almost *ad nauseam* in describing the first quality of an officer. What does it mean? General Lee wrote in 1863 that he believed "our army would be invincible if it were properly organized and officered. There were never such men in an army before. They will go anywhere and do anything if properly led. But there is the difficulty . . . proper commanders." Indeed, there is our plight today. What, then, are the elements which contribute to leadership? Let us try to search behind the platitudes.

Ideally, the leader should be superior in all the mental, moral and physical elements which make

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up his personality. We rarely find all these elements in equal proportion in any particular individual, and a man's personality is usually more marked in one than in another. Depending upon his job, the emphasis on physical qualities, for instance, may well be the most appropriate to establish him as a leader. Indeed, in early society the strong were masters of the weak. Today the intelligent may well be masters of the strong. In war, whatever the qualities which mark a man as superior and fit for leadership, self-sufficient morale is necessary. Superior qualities contribute to form an authoritative personality, and if this can be combined with those complex qualities of humour, understanding, humanity and natural attraction which form a magnetic personality, men will not only admire but will also wish to be associated with that personality. For the rest the good leader must be master of his profession.

"Manners makyth man" should be a motto of the leader. This might be illustrated by the following notes of advice to a young officer: "Know your men as individuals, for that breeds trust: hold your men in high regard, for they will reciprocate: attend to the welfare of men, for that makes them content: foster tradition and customs, for that builds up their pride: encourage those who do well, for that gratifies them: never be too proud to do the most menial tasks with them, for that challenges them and gives a lead: abhor class prejudice, for it is a degrading ill-taste: set an example in all things, as much in dress and as in courage, for you should never demand standards which you do not observe yourself: never accept second class standards, for precedent in such things is dangerous: never be familiar, for that breeds contempt: never use bad language before men, for it is evidence of ill-breeding: never act or speak to men in anger, for it shows lack of self-control: always explain orders when possible, for understanding increases the will and initiative of men in even the smallest task: remember punishment is only a last resort, for it means that you have failed: in all things act with common sense and humanity." Such things constitute a simple and considerate standard of behaviour which can readily be understood and appreciated by the men under an officer.

After considering the character of the leader towards his fellow-men, we might consider his character in abstract. The leader should be a complete man, and should span the realm of the mental and moral spheres of human perception. He may thus appear to the casual observer to possess contradictory traits. He may be deadly earnest in great enterprises, yet good-humoured in trifles, austere yet generous-hearted, high-minded yet humble, intrepid yet calculating, fired with zeal yet patient, imaginative yet severely practical. Such are but a few of the broad reaches of the human mind which he will survey with equanimity. The leader must have knowledge of himself, control of himself and a deep perception of people, for only these are predictable in the great design of fate. For in essence leadership is the capacity for understanding all about him, the will to dominate every problem, and the ability to control all circumstances, both the simplest and the most complex matters of human behaviour, both the smallest details in the military art to the greatest enterprises of war.

CONCLUSION

We have tried to paint a broader picture of discipline than the over-simplified notion of unquestioning obedience and the direct methods of obtaining it. We may say that our political institutions, the national conception of duty, the efficiency of the corps of officers and love of country are the foundations of vigour and staunchness in the battle. No greater compliment could be paid to the discipline of the English infantry than by Napoleon when he remarked: "They never know when they are beaten." However, superior numbers and superior strategy are of no avail unless forces are brought into action in co-ordinated effort at the right time and at the decisive point. It is not sufficient that men should be able to fight fiercely and use their initiative in the fullest measure. Precision of movement and action is required, and this implies obedience to command. General Lee issued a circular to his incomparably enthusiastic followers in which he states that men must be habituated to obey or they cannot be controlled in battle, and that the neglect of the least important order impairs the proper influence of the officer. "When the men in the ranks understand all that discipline involves, safety, health, efficiency, victory, it is easily maintained." Although the process of being broken to discipline is undoubtedly galling to the instincts of free men, they must be made to understand that the enthusiasm of the individual, his goodwill and his native courage and initiative cannot exclude the necessity for obedience which increases their efficiency and contributes to their own safety. Obedience implies that singleness of purpose through which alone the commander's plan can most speedily be brought to success.

Thus we have the notion of "natural" discipline as a dynamic quality springing from the deepest influences in a man's life and origin. Nothing must be done to chill this spirit of enterprise. And yet there is the need for the element of "artificial" discipline to co-ordinate the sum

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of the enterprise of each individual to the most effective use. Today, the speed of war, the vastness of battle areas, and the complexity of combining air, land and sea forces demand greater precision than ever in the past. They also demand greater initiative from the individual and from more individuals. The aim must therefore be to reconcile the two requirements in such a way that they are not mutually exclusive but are complementary. The habit of obedience to the spirit of an order, with intelligent interpretation of the action which should flow from it, must be made the source of staunch resistance and intrepid enterprise in battle. Who can doubt that the catalyst in achieving such a discipline is leadership?

Any proposals for practical measures to increase the discipline in the Services should therefore be aimed towards producing the necessary conditions for good leadership—on the one hand by attention to the officers, and on the other by encouraging those characteristics which are to be noted in men who are well led. The most evident of these are, perhaps, the contentment of mind and willingness of well-led men. They are conscious of a sense of their own importance in the scheme of things. For, as Pericles has said: "Happiness is freedom; freedom is courage."

It is concluded that in our modern democracy we have all the elements which contribute towards the development of the active, intelligent and precise discipline which modern war demands. It is clear, however, that we are more dependent than ever for national cohesion and for cohesion within the Services in the test of battle upon the supreme factor of leadership. The nature of the social progress today may increase the incidence of conflicting opinions and divided counsels amongst the many, but it also increases the opportunities for attaining dynamic discipline under good leadership. The supreme factor in discipline today is leadership, and no cost can be too great to the nation to foster those who possess these qualities and to ensure that the best leaders are brought to positions where they can develop their talents and exert their influence.

Morale as the Basis of Modern War Strategy

WE are witnessing, in these anxious days of move and counter-move between the Western Powers and Russia, a repetition of what in 1939 we termed "the new war strategy." The First World War of 1914-18 was the last of the old-style wars. For the Second World War Germany introduced a new technique and in order to draw comparisons between what is taking place today and what took place prior to the outbreak of the last war it is necessary to go back to the defeat of that nation in 1918 and what followed. By doing so we can trace the birth of the "new idea" back to this earlier period.

The Defeat of Germany in 1918 and what Followed

From 1916 Communistic propaganda had eaten into the souls of a people whose minds and bodies were already weakened by privation due to the British blockade. Physically and psychologically they continued to weaken, and by 1918 physically they were wrecks, and mentally their morale had been destroyed. Ideals were shattered, their confidence gone. They could no longer persevere. Unable to stand further reverses, they sought an armistice and finally accepted the harsh terms of the Treaty of Versailles.

Defeat came to this nation at a time when her powerful armies were still in being, and in comparison with the 1945 situation her armies were undefeated. Here we see the germ of the idea of "the new war strategy." Let us examine what followed.

The spirit of militarism remained in a proud remnant of the German Army and they vowed that they would reinstate Germany in her former position, and that never again would they allow defeat to be brought about by the undermining of the nation's morale. From 1918 onwards they never ceased to instil into her young people that the Army remained undefeated. They made it clear that the civilian population let them down,

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and how this was brought about by the undermining of the nation's morale.

The Stahlhelm, akin to our British Legion, Comrades of the R.A.F. and like organizations, took up the cause. They inaugurated the Junior Stahlhelm. This they carefully and diligently "nursed" and "fed" with pride and success in the "invincible tradition" and the *vital* importance or morale of civilians as well, as of the armed forces. Here was the beginning of "total warfare," which no longer embraces the armed forces alone but the whole nation.

When the Nazis seized power they took over these organizations as the nucleus of the new army, to be developed *with the rest of the nation*, and thoroughly "drilled" according to the new idea of war.

What is this New War Strategy?

It decrees that war is a "totalitarian" business, embracing in the most direct way the civilian population even more than the armed forces.

The new extended strategy was founded on a psychological basis which emphasized the all-important factor, morale.

War was analysed and planned into four phases:

1. Propaganda.
2. Diplomacy.
3. Economic pressure.
4. Military pressure.

} Three-quarters attacking morale.

It was held and practised that "policy" should no longer be determined by the professional opinion of the military authorities. Further, that since military pressure was but one of the four phases, and the last one, it would be used only if necessary, and only after the other three, propaganda, diplomacy and economic pressure, had prepared the way.

Military pressure was to be used only when the morale of the intended victim had been destroyed or sufficiently weakened to make the minimum of military pressure necessary.

We have not far to seek when looking back for examples of the success of this new war strategy.

In Austria and Slovakia morale was almost completely destroyed and little or no military pressure was needed.

With Poland and Greece the morale of the people remained higher and so military pressure was necessary.

We witnessed in 1940, to our utter amazement, the sudden collapse of a great nation, our ally France; not through the destruction of her forces; the navy was intact, her air force still formidable, and a large part of her army capable of continued resistance.

By insidious propaganda her confidence was slowly but surely undermined until at length her morale was insufficient to withstand the continued reverses, and despite a solemn pledge not to do so, she signed a separate armistice.

Had the morale of the people of France and that of her fighting forces been sufficient to withstand the early adverse circumstances, the humiliating terms offered by the armistice would have been rejected, and her contribution to our ultimate victory would have been considerably greater.

These examples from the past are sufficient for our purpose. According to the new concept of war, hostilities between nations no longer begin by a declaration of a state of war. It is waged steadily over a long period preceding the use of armed strength and often a nation's downfall is accomplished by the insidious propaganda, diplomacy and economic pressure followed up by the threat of more forcible measures. Countries are "absorbed" by their neighbours without striking a blow in their defence.

What is Morale

Having witnessed the two examples of defeat of first Germany and then France, not by the utter defeat of their armed forces but by the undermining of the morale of their people, it is of vital importance that, if we are to survive as a nation, we should maintain the morale of the British people at a very high level. To do so it is necessary to understand what we mean by morale. Let us analyse it.

Although inseparable from discipline, the morale of individuals comes from within and is greatly influenced by physical fitness and external discipline. It is produced in individuals by external authority implanting a habit of cheerful obedience within those for whose disciplinary training they are responsible. When individuals are capable of maintaining the same high standard of discipline, after the external authority has been removed, then discipline reaches a degree of *permanence* and in individual and groups alike morale will be high enough to withstand the demoralizing infllences with which the enemy will surround them.

Call it patriotism or what you will, the result is that a spirit of cheerful obedience to the common good of all is born, which has a degree of permanence that remains unquenched by fear, fatigue, hunger or sedition. It enables all citizens of a country to rise to heights of achievement and endurance which will bring their country through to victory as was amply shown by the British people when they stood alone against the greatly

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superior military strength of Germany. This spirit is that thing called "morale." We can define it in simple language as "an unconquerable spirit of determination to achieve a preconceived aim." The aim of every one of us today is to ensure that no "new war strategy" will be allowed to undermine the morale of the British people.

Morale by Enthusiasm out of Discipline

We must not confuse enthusiasm with either discipline or morale. Although a factor of immense importance and capable of producing astonishing results, it is incapable of sustaining a prolonged effort, is fundamentally unstable and dependent upon external circumstances for its continued existence.

Today, when the whole manhood of the nation is involved in war, we begin with enthusiasm, and with this basis behind the shelter of a disciplined army, transform the enthusiastic, untrained material into an efficient fighting force, with which to achieve our final victory.

Although much has already been written about discipline elsewhere, any analysis of morale would be incomplete without showing how inseparable it is from discipline.

From a Service point of view the simplest definition of discipline is: "That quality which transforms a disorganized rabble into an efficient fighting force."

With "total war" today this means that the whole nation must be transformed into an efficient fighting force, whether in civil defence, factories or our armed forces, and therefore it is vital that we should build up a spirit of willing and cheerful obedience to their leaders among our people, in the workshops, in the fields, in the mines, and everywhere else where Britons are to be found. This in Service terms is discipline.

It cannot be instantly transmitted, it takes some time to build up in bodies of men and women, but it has a quality of permanence.

Discipline, so essential to a nation threatened with war, develops and encourages reliability under all conditions; habit and custom are the corner-stones of that reliability, and good leadership and justice the sound foundations on which it is built.

It produces a habit of willing obedience to orders which in itself creates orderliness, avoids confusion and promotes efficiency. The principal stimulant and active agency in maintaining discipline once it is built up is the knowledge that it aims at the well-being of the whole nation.

From good discipline comes a high standard of morale which can be gauged by the behaviour of individuals under all conditions.

The greatest leaders can do but little with an undisciplined rabble, and so, however strong the inspiration, however imperative the needs, history can show no example of the triumph of a cause whose supporters have not been organized upon a military and disciplined basis.

The Cold War of 1948

Having explained:

(1) The new war strategy;

(2) Morale and discipline;

we can now apply their implications to current events.

In recent years we have once again seen the new war strategy, which Hitler employed before and during the last war, being used by Russia.

She has time and again used the first three phases of this new concept of war. By propaganda, diplomacy and economic pressure she has absorbed one by one neighbouring countries, always backed by a powerful army and air force whose very existence was enough to intimidate weaker nations.

During this period Russia has not hesitated to use these same means against the more powerful Western Powers with the object of forcing them to withdraw from Berlin and so leave the German capital, with all it means to the German people, to be completely overrun by the Russians. It would then only be one further step to drive home the Communist wedge and convert the whole of Germany into yet another vassal state.

As long as she can achieve her aims without using the last phase of this new strategy (*i.e.*, armed force), she will continue to do so; but is she prepared to take this last step?

For months there have been international tension and discord in Berlin. At times it almost seemed as if an armed clash was inevitable. With enormous forces mobilized, why has she refrained from using them when thwarted by the Western Powers in recent months?

Why wasn't there war in July when we ran the blockade of Berlin, by using military aircraft? Is it that because, ever since Lenin in 1918 laid down the Communist policy of world revolution, they have been so successful with their propaganda and fifth-column activities, that they will never go beyond the threat of war, backed up by powerful forces to make their threat no empty one?

These are the questions which are uppermost in the minds of the Western World today.

To what extent the Western Powers will allow themselves to be intimidated must necessarily be decided by their preparedness for an armed conflict.

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Our preparedness depends not on the efficiency of our fighting forces alone but upon the morale of our peoples. It depends to what extent Russia has undermined our morale in the past years by employing the new war strategy. We see clear signs of her success in many quarters: nation-wide disturbances in France caused by Communism, class hatred and unrest stirred up in Britain by Russian propaganda, and vast strikes and labour trouble in America due to the same cause. The modern tendency to accept a lower standard of discipline in our fighting forces, with its consequent weakening of morale, is not unconnected with Communistic teachings in the past in many of our schools, and insidious propaganda spread through the homes of British workers from active Communist cells in this country.

To what extent our morale has been impaired would not be apparent until the necessity of mobilization for war was imminent.

The British are a curious people and those now greying at the temples and a little thin on top will remember the state of unrest in this country when the First World War broke upon us. Civil war threatened in Ireland, the women of this country rioting in the streets for votes, and widespread labour troubles: yet these family affairs were all put on one side when more serious matters arose, and amidst wild enthusiasm thousands of every class, creed and political party flocked to "join the Colours." Heartening as the thought of this is, we cannot rely upon it under changed conditions of today and it is vital to our future survival that we prevent the further undermining of our people's morale and take action to weld the nation together, because a house divided against itself is in grave danger.

Finally, a study of the question from the Russian view would assist in deciding whether she will follow up the first three stages of her new war strategy by military pressure when all else fails. The Russians, being Orientals, are subservient to strength in others, but ruthless when they possess greater strength than their rivals. In the former case they will get all they can by cunning bargaining and in the latter instance by force.

With the example of Germany and Japan before them and the knowledge that in the space of a few months of war their own fate might be worse, is it likely that they would take such a risk? It is this fear and this fear healthily developed in the mind of all Russians which will save the world from another war, the consequences of which are beyond imagination.

While the Western Powers are united, their armed forces formidable and their peoples not divided amongst themselves, it is unlikely that Russia would willingly start a war which, under such circumstances, could only bring the most frightful consequences upon her people.

A. H. S.

Group Capt A.H. Stradling

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TIGER FORCE

Its Conception, Planning and Fate

BY "AQUILA"

TIGER Force was the British Strategic Bomber Force which we were preparing to dispatch to the Pacific, when the Japanese surrendered. Not much has been written or heard of it for the good reason that it never operated. Nevertheless, its history may be of some interest, for the wholesale movement of strategic air forces may well be a necessity in a conventional war of the future.

On 6th December, 1941, the Japanese attacked Pearl Harbour. There followed the tale of evacuations and retreats from Singapore, the Philippines, Burma and the East Indies, and the abandoning of innumerable small islands to the mercy of the enemy. The American reaction, in spite of the grievous damage to her fleet, was swift. Her industry, already on the roll under the stimulus of the European War and British purchases of munitions, was accelerated with all the urge of which the American people are capable.

On 17th April, 1942, General Doolittle led a force of Mitchell twin-engine bombers from the aircraft carrier *Hornet* to drop the first bombs on Tokyo. For the Japanese this was the writing on the wall. Between 4th and 6th June the Battle of Midway was fought. The Japanese received their first major check. In that battle there emerged the image of things to come. With the inspiration of these feats of arms and the lessons of the British endeavours in Europe, the United States started to build a great fleet of giant aircraft. If these were to penetrate to the centre of the wide circle of bases which the Japanese had occupied around their island home—the Aleutians, Wake, Guam, New Guinea, the East Indies and Malaya—then the range of their aircraft would have to be in the order of four to five thousand miles.

Meanwhile the available forces of all arms were striving to hold the perimeter while sufficient strength was mobilized to begin the relentless process of driving from all directions towards the heart of the Japanese Empire. With every advance the problems of range, airfields and logistics eased, and the American air threat to the Japanese mainland increased. Once that air threat could be focused effectively upon Japan, and once the new bombers were in the battle line, all Japanese hope of conquest, all hope of retaining what they had already overrun, and even the ability to ensure the integrity of Japan itself, quickly faded.

The British were involved in the Japanese War every bit as much as the Americans, from the point of strategic interests. However, we were committed up to the limit of our resources and strength in the war against Germany and Italy, except for those forces which we could spare to oppose the Japanese in Burma. America had therefore to shoulder the main burden of the Pacific War. In these circumstances it was natural that the Americans should tend to divert some of the weapons being made in the States for our use against Europe to the Pacific War. Accordingly it was necessary to agree to a common strategy to which we should both work in harmony. Early in 1943 Mr. Churchill and President Roosevelt met at Casablanca to consider these far-reaching strategic problems. Here it was laid down as the basis of Anglo-American strategy that our common aim would be to encompass and defeat the Axis Powers in Europe first, and then to turn our combined effort against Japan. This could not, of course, be to the exclusion of a major effort in the Pacific nor at the expense of our operations for the recapture of Burma. We were not slow to demonstrate that it was our intention to throw all our strength into the war against Japan as soon as we could, and that we had not the slightest intention of leaving the whole burden of the Pacific War to the Americans. In the same year, therefore, we sent representatives to join the American planners in Washington.

The first contribution to the Pacific War was to be a British fleet, which was to arrive as soon as it could be released from European waters. The next contribution was to be a long-range bomber force. However, it was realized that it would be some time before such a force could be released from Europe, if at all before the defeat of Germany. The very nature of air power, the nature of the strategy which we had adopted against the Axis, and the flexibility of our air forces which would allow the full weight of our bombers to be felt at every stage of the war—in the defence,

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against the U-boat menace, against the enemy industry in the strategic attack, against communication targets in the preparatory phases before an invasion, and even on the battlefield during the subsequent operations on the Continent—made it impossible to reduce our bomber forces except at the direct expense of the European War. In fact, the Americans were already planning to support our growing effort from Britain with an air force which would eventually be bigger than Bomber Command itself. Thus the day of our intervention in the strategic bombing of Japan was remote. Nevertheless, we gave what advice we could and were kept fully informed of the various plans to base the great American aircraft within range of Japan. There was, for instance, a proposal to base the aircraft in the Aleutians, but the appalling weather conditions were the main difficulty. There was a proposal to base them on certain airfields in South China, but this would have meant supplying them with petrol from India across "the Hump." It was a feasible operation, but would have been an enormous undertaking and would, of course, have reduced the capacity of "the Hump" route for aid to China to negligible proportions. In the event neither of these expedients proved necessary.

In 1944 Italy was forced out of the war. Later the Continent was successfully invaded, and the days of Germany were numbered. At Quebec Mr. Churchill made a firm forecast that we should be able to contribute a strategic air force to the Pacific War. Towards the end of 1944 the first practical steps were taken to consider possible plans for the transfer of a long-range bomber force from the European to the Pacific theatre of war. Air Marshal Sir Hugh Lloyd made several visits to the States to make preliminary investigations as to where our aircraft could be based. In 1945 the Air Marshal was appointed Air Officer Commanding-in-Chief-Designate of the British air force-to-be. Its code name was first of all the uninspiring word "Mould," which was soon changed to "Tiger Force." In April, when the German War appeared at last to be drawing to a final conclusion, the Tiger Force staff was established and manned.

By this time the Americans, aided by the British Pacific Fleet, had made considerable progress in their island-by-island advance towards Japan. This had made it possible for the Americans to establish their strategic bomber bases within 1,500 miles of Tokyo. These were at Guam and Saipan in the Marianna group of islands. At the same time, General MacArthur had reached and occupied the Philippine Islands, although the Japanese were still being mopped up in the north of Luzon. It was here that the Americans first allotted the British force an area of ground to develop as a bomber base. It was an ample area in the Cagayan Valley, which had only to be cleared of the remnants of the Japanese. The distance from Tokyo was 1,100 miles, making it necessary for the aircraft to have an over-all range of some 2,500 miles. Since our bombers had been built for the shorter ranges of the European War, we would have had to resort to methods such as refuelling in the air if an effective bomb load in the order of 10,000 lb. or more was to be carried. As a matter of fact, such a system had been tried out and would have been practical if clumsy. It would have meant that half the aircraft would have been tankers or milch cows. This would therefore have halved the effective bomb load per aircraft for the force as a whole.

However, the Pacific War was going rather better than the Americans had expected. Plans were drawn up which involved the bypassing of Formosa, the capture of Okinawa, which would be developed with all speed into an air base of enormous capacity, and the invasion of Japan by the autumn of the same year, 1945.

From the point of view of many Americans, and even of certain British critics, there seemed to be very little case for sending a British strategic air force to the Pacific at all. It was true that there was limited airfield space available and that the Americans were short of constructional engineers. Thus there was hardly room for the aircraft they already had out there. As soon as the European conflict came to an end, the Americans would, of course, have their own European and Mediterranean strategic air forces to transfer to the Pacific. Even they would be superfluous, so where did the British come in?

There were, however, several advantages which the employment of British aircraft and crews could afford. The Americans had not developed the target-marking technique and the use of pathfinders to the same pitch as we had. This was mainly because in Europe the Americans had operated by day, and in the Pacific they had relied upon their fire bombs to burn the inflammable cities of Japan, and these do not require to be aimed with the same precision as high explosive. Now that the invasion of Japan was approaching, it would become necessary to attack the railway and road systems as part of the interdiction programme. Thus it was desirable that highly accurate high-explosive attacks by night should be delivered, and the British squadrons were expert at this.

Amongst the interdiction targets were the tunnels joining the two southern islands of Kyushu and Honshu. The Americans had not

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yet developed heavy bombs like the Tallboy (12,000 lb.) and Grand Slam (22,000 lb.), and these would be ideal for the attack of such targets. Moreover, the Japanese system of defence was to dig themselves into the ground. They constructed the most intricate network of tunnels and galleries, and one of the only methods of breaking up these defences was to use deep-penetration bombs of the Tallboy variety. Since our two best precision bombing squadrons had achieved an extremely high standard of marksmanship, it was proposed that they should be sent to the Pacific with Tiger Force. No. 9 Squadron had had an average error of 110 yards, and No. 617 Squadron an average error of 127 yards on recent trials.

Other less obvious advantages were that when once operating within optimum range of their targets the Lancasters were able to carry more incendiaries than the B29. To be precise, the B29 had forty hooks, each carrying 38 x 6 lb. bombs = 1,520 bombs totalling 9,120 lb.; while the Lancaster had eighteen hooks, each carrying (with adaptor) 28 x 20 lb. bombs = 504 bombs totalling 10,080 lb. It was not always realized what an extremely effective aircraft the Lancaster was. Another factor which made for economy in operations as far as airfield construction was concerned was that the Lancaster could operate from a runway of 6,000 feet whereas the B29 used every bit of its minimum runway length of 8,500 feet. Yet another consideration was that the British had become particularly expert at sea-mining operations in Europe, and it was now intended that the Japanese ports should be sown up as part of the preparatory operations before the invasion. On the other hand, the main disadvantage of the Lancaster and Lincoln was their range. Maximum ranges and bomb loads were: Lancaster, 2,600 miles with 4,000 lb.; Lincoln, 2,800 miles with 6,000 lb. If, however, our aircraft could be based on the islands captured north of the Philippines they would be able to carry their maximum bomb loads of up to 12,000 and 14,000 lb.

When Sir Hugh Lloyd visited Washington once again in March, 1945, he was told that the Americans now proposed to capture the little island of Miyako, south-west of Okinawa. It was to be handed over to us to develop as a bomber base in accordance with our own designs. This was an appreciable advantage to us as compared with the area in Luzon because it almost halved the distance to Tokyo. It had, of course, the disadvantage that everything would have to be landed across beaches, which to our way of thinking was a considerable commitment. This was particularly the case where a strategic bomber force was concerned, a proposition which had never been tackled before, even by the Americans. At least it would now be unnecessary to employ the system of refuelling in the air which might have been forced upon us, with all its consequent complications, if we had had to base our Lancasters and Lincolns at a greater distance from Japan.

At the end of April the newly appointed staff began to embark upon the detailed administrative plan. All that was known was that a bomber force had to be picked up from this country and set in full battle trim upon a hitherto uninhabited island in the Pacific Ocean. The planners had had no experience of the Pacific, and were, for instance, unaware of the scales of equipment which the Americans took to war with them in that theatre. It seemed clear that the most economical use would be made of the available shipping if there was a degree of integration with the American forces, especially in the sphere of logistics. Could the Americans spare any landing craft if necessary to bridge the water gap, otherwise we would have to make provision for them ourselves? Since we had a large-scale landing in the offing against Malaya, we would have found it very difficult to make even a few landing craft available. Judging by the operational conditions in the European theatre, we could only base two or three squadrons on a single airfield. Thus our bill for airfields looked formidable, and we doubted if we could find the engineering units required to build them. Were we indeed to be entirely divorced from the American operational command, because if so we would need our own air-sea rescue organization, and our own reconnaisance squadron. All these problems and many others had to be answered, but it was not easy to come to any agreement with the American commanders at 10,000 miles distance, nor to draw up immediately a comprehensive administrative plan.

With every day the battle in Europe was swinging decisively in our favour. With every day new pressure was brought to bear upon the Tiger Force staff to produce a detailed plan from which the shipping requirements could be estimated, personnel adjustments made, and units withdrawn or re-equipped as necessary. The Chiefs of Staff had passed the responsibility for mounting the force to the Air Ministry, since it was essentially an air project. As a result of a signal from the American Chiefs of Staff that a force of up to ten squadrons would be accepted but that it must be self-supporting from "tidewater to aircraft," the Air Ministry had drawn up an outline plan at their level. This laid down the allocation of the forces available for Tiger Force, and the

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dates by which the Force should aim to be ready. It gave a phased estimate of the approximate shipping lift which would be available to convey the force to the Pacific. It also gave an estimate of the personnel and units which would be available for the opening up of the base and constructing the airfield. These amounted to approximately 15,000 constructional engineers, and a further 3,000 to 4,000 administrative troops—port operating companies, maintenance and transport companies, signals units and general administrative troops. Of these some 10,000 were to be Army personnel. We were also given the operational units which were to form the first group of ten squadrons. This amounted to 200 aircraft and 15,500 personnel. Thus the total number of personnel which we had now to introduce into the Pacific with the first half of Tiger Force was approximately 34,000. As soon as sufficient airfield accommodation was available a second group of 200 aircraft would be ready to move. However, it would clearly be some months before the whole Force could be transferred with all its supporting units to the Pacific.

Meanwhile there were a number of problems with which the air and administrative staffs were wrestling. It was a new departure to uproot a bomber group which had spent most of the war ensconced in some fine old English country house and to convert it to a near-tactical air force basis. Nevertheless, as soon as the European War came to an end the task was tackled manfully by No. 5 Group. It was well on the way to completing its training and reorganization when the Japanese surrendered. Amongst the problems which had to be resolved was the necessity for adopting new tactics. Whereas in this country Bomber Command had relied upon a combination of night cover and concentration in time and space, which in turn meant that a large number of airfields were required to launch and receive the aircraft, conditions in the Pacific were quite different. The problem was airfield construction. Therefore as many aircraft as possible had to be put on to each airfield. This proved to be tactically feasible because there was comparatively light air opposition, and this meant that it was no longer necessary to concentrate the bomber stream in time and space. The Americans used to accommodate up to two hundred B29's on one double-strip airfield. We would have had to do the same.

A number of signals passed between London and America on every conceivable subject. Amongst the more critical issues was the selection of suitable bombs. However, it was difficult for the theatre commanders to know what stage the war would have reached by the time of our arrival, and we had to resort to a guess. The comparative virtues of the Mark XIV and the S.A.B.S. bombsights gave rise to some controversy, since it was expected that most of our targets would be precision rather than area targets. The Mark XIV was the standard sight for Bomber Command except for Nos. 9 and 617 Squadrons, which were equipped with S.A.B.S. and had used it with such effect against submarine pens and capital ships. This problem was eventually decided by supply difficulties and we had to accept the position as it was. Other air staff problems included the selection of one of the two pathfinder techniques which had been developed by Nos. 5 and 8 Groups respectively; the modification of our flying control system to the new conditions in the Pacific where one airfield would have to deal with very large numbers of aircraft; the provision of meteorological aircraft and an air-sea rescue equipment; the training of air crew in formation flying, which was a new departure for these erstwhile denizens of the night—and so forth. All these and many other operational matters had to be provided for in the very short time available.

The administrative staff had an even greater burden to bear at this juncture. The whole problem of mounting a force which must sail 14,000 miles to its destination and then disembark across open beaches is pregnant with implications—whether to form the units tactically before leaving the United Kingdom; whether to waterproof vehicles; whether the ships' cranes will be able to unload the heavy vehicles; whether tropical kit alone is required; the examination of all personnel for medical fitness, disentangling those likely to come up for release, to put in for compassionate postings or who have just returned from an overseas tour; the integration of the Army units with the Royal Air Force organization; the aircraft engine and personnel replacement rates; the location of storage depots; the use of air transport to ferry personnel and to supply the Force with spares and engines from India and the United Kingdom; the establishing of training units to keep reserve air crew in trim, to say nothing of the welfare organization which must follow any modern force into the field. These are but a few of the problems taken at random from the great mass of matter which must be thought into and carefully planned if all is to work smoothly and efficiently on arrival.

Although precise details had not yet been arranged with the Americans as to how we should fit into the Pacific theatre, the Chiefs of Staff were so keen to ensure that there was no delay in the transfer of our effort from Europe to Japan that shipping was made available in

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June to take the first flight of the Force. Thus a plan had to be made for the composition of an immediate convoy, as well as for the phased sailing of the Force subsequently. A good deal of give and take was required because the shipping frequently became available only at the last moment, and units or detachments of units had to be found to fill it in a hurry. On the other hand, additional shipping might have to be found to cater for the fluctuating demands of a plan which was only part formed and liable to adjustment in the light of American wishes and the course of the war in the Pacific, the logistic limitations and the uncertainty of the contributions which might be expected from the Dominions of Canada, Australia and New Zealand. There was a risk, of course, that the first convoy might arrive in the Pacific and, in the light of subsequent talks with the Americans as to the nature of our contribution, its composition might turn out to be wholly unacceptable. This was realized, and if such a situation had arisen the whole convoy could have been diverted to Australia or South-East Asia Command, where the engineers and construction material included in it would have been put to good use. The great thing was to make a start and to show that we meant business.

We were still wondering how the Americans would be able to fit us into their plans in spite of their acceptance of our Force in principle, when we read a report in *The Times* of a Press interview given by General Arnold, Chief of the United States Army Air Staff. He had said: "The Combined Chiefs of Staff intend to use British air forces, including R.C.A.F. and R.A.A.F., to the maximum against Japan. We plan to drop in 1946 thrice as many bombs on Japan as were dropped on Germany. They will be dropped in an area one-tenth the size of Germany. Our plans call for the dropping of 2,000,000 tons of bombs, including the British contribution."

In the middle of June the first convoy sailed under the code name of "Shield." It consisted of ten Liberty ships carrying vehicles, constructional plant, engineer materials, and a few stores to begin the build-up of the depots. The *Empress of Australia* sailed with the personnel a fortnight later. Her greater speed would allow her to join up with the Liberty ships in the Pacific. We hoped that by the time the *Empress* had reached Panama we would have sufficient information to give more precise instructions. To procure this information the Chiefs of Staff sent Air Marshal Sir Hugh Lloyd at the head of a joint planning staff to make final and more detailed arrangements with the Americans about the reception of the whole Force and the destination of the convoy which was already on its way.

On arrival in Washington it was suggested to the Air Marshal that the most satisfactory way of making final arrangements for Tiger Force would probably be to visit the Headquarters of Admiral Nimitz and General MacArthur, in Guam and Manila respectively. For this purpose air travel would be arranged for his staff of five officers as well. It took three days to reach Guam.

Here it was possible to see what was involved from the American point of view in the reception of Tiger Force. The Americans had drawn up convoy tables for their operations throughout the Pacific some months in advance. They had just attacked and captured Okinawa, and were rushing in all available constructional engineers and material to build the enormous air base as planned. There were no useful ports at Okinawa, and everything had to pass across the beaches. The bottleneck was the water gap between the ships and the road communications ashore. When the British planning team arrived the daily tonnage being passed over the beaches was 36,000, which, owing to lack of landing craft and stevedores, was some 4,000 tons short of the target, and very far short of the eventual target. This meant that there was an increasing backlog of unloaded shipping lying off Okinawa. These ships simply provided targets for the Japanese air and Kamekaze attacks. Thus it can be seen that the Americans were already very tight and that they certainly had nothing to spare in the way of unloading facilities for us.

In spite of this, all commanders and staff officers connected with these delicately balanced logistic problems were very helpful and intended that by hook or by crook room should be made for us as soon as humanly possible. It was finally agreed that the British force should be based in Okinawa and that it should be welded into the over-all organization then pertaining in the theatre. Tiger Force was to be one of the three strategic air forces under the command of General Carl Spaatz, Commanding General of the United States Army Strategic Air Forces (U.S.A.S.T.A.F.). All fuel, replacement vehicles and common-user stores would be drawn from American sources. Our engineers would be placed under the command of the American officer responsible for construction, and they would become part and parcel of the American constructional organization, with the small proviso that if it was found convenient the British should work on airfields occupied by Commonwealth forces. Meanwhile we undertook, in answer to the special request of General Spaatz supported by General MacArthur, to dispatch Nos. 9 and 617 Squadrons to arrive in Okinawa

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in time to support the first landings on the Japanese mainland on 1st November.

When these arrangements had been completed the Air Marshal and his party returned to the United Kingdom, leaving an officer to act as his liaison in the Pacific. This officer visited the authorities who would be concerned with the detailed reception arrangements, and kept them in touch with any variations in our plans on the one hand, and indicated any methods in which we could be of assistance to the Americans by signalling back to London. By this time a second convoy had sailed from the United Kingdom, but it had been directed east about, via Australia. Now that we had discussed our mutual difficulties and a firm plan had been agreed, there was nothing in which the Americans did not give us their whole-hearted assistance. All stores were to be impartially at our disposal, and we were allotted one of the finest airfields in Okinawa, Yontan, for the first squadrons of the Force. By the beginning of August some of our key survey personnel, of which the Americans were short, arrived in Okinawa by air. They were the first and only members of Tiger Force to reach their appointed destination before the atomic bombs fell on Hiroshima and Nagasaki.

When the Japanese surrendered, our first convoy, "Shield," was approaching Eniwetok. Revised plans had not yet been hatched. However, the *Empress of Australia* was short of medical supplies and victuals. She was directed to Manus, an advanced base of the British Pacific Fleet in the Admiralty Islands. By the time she had arrived there it had been decided by London that the whole convoy should be handed over to the British Pacific Fleet to assist in the occupation and rehabilitation of Hong Kong. In due course the airmen performed this task with outstanding merit. Meanwhile the second convoy, with the code name of "Vacuum," which was already at sea, was divided in two, some units going into Singapore and others sailing on to join the contingent already in Hong Kong.

Although the Force never came into operation, it was a valuable exercise in the planning and movement of a strategic air force, and useful lessons were learnt. While no one could regret the end of the Japanese War, it was a pity that Tiger Force did not come into action as the partner to the American air forces, as the British Pacific Fleet was the partner of the American Navy, during those last dramatic months of the Pacific War. It would surely have added new strength to the Anglo-American bonds of comradeship.

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Recruiting and the Royal Air Force

TWO years ago the Chief of the Air Staff warned that the man-power situation of the Royal Air Force was "dangerous." At Manchester, just over six months ago, he described the situation as even more dangerous because more skilled and experienced personnel had gone back to civilian life and the compensating flow into the Force was inadequate.

The Memorandum on the Air Estimates for the current financial year gives an indication of the numerical position and at the end of this article is a table of the latest available recruiting figures. The Memorandum states that at the end of the war the Regular element in the Force numbered fewer than 40,000, of whom many were nearing the end of their engagements. By the time of the Memorandum this figure had been raised to about 100,000. In the meantime about a million men and women had been released under the age and service group system, and some 135,000 were being released or discharged during this year. This figure must now be under revision in the light of the recent Government statement on retarding releases.

Announcing that change, the Lord President of the Council said: "There is no other method by which the Armed Forces could meet the commitments they now have; in this way alone can the loss of trained men be halted."

For in the case of the Air Force the Regular element is still only about 40 per cent. of the total Force, and the recruiting table below shows a decline this year in R.A.F. recruiting. The year 1947 can fairly be described as a good year for recruiting, but much of it was a turnover on to Regular engagements of officers and men already serving rather than the entry of new life on to long-service engagements. Further, many of these were for short periods, short-service commissions and three-year or four-year engagements under the Bounty scheme. This latter source was steadily drying up in the first three months of this year and can be presumed to have dried up faster since then. In short, it is a source which cannot be tapped again, and recruiting, without an emergency more serious even than at present, must become a formidable task.

It is not only the rate of flow of recruits which can render the situation dangerous within the Air Force, but the lack of balance between trades resulting not only from the release scheme but also from the uneven recruiting response to different trades in the Service, and the complexities induced by National Service. Although the balance of trades is still not satisfactory, some improvement is becoming apparent, and serious attention is being given to this aspect.

Since the end of the war, then, R.A.F. recruiting has been directed to two main ends: the retention of skill and experience, on the one hand, and the enlistment of fresh ability on the other. The obstacles in both cases have been considerable and the success not entirely insignificant, though still insufficient. Except for token entries of aircraft apprentices, Regular recruiting had been entirely suspended during the war.

First, the retention of skill and experience. Undoubtedly, on the officer side, the R.A.F. has lost heavily. It must have been apparent long before the end of the war that the Force would not revert to its pre-war size, and yet the permanent commission establishment was still fixed in 1945 at its pre-war figure, pending a Government decision on the size of the Armed Forces in relation to such factors as the international situation, domestic policy and the like. This establishment figure has been raised since then to a more satisfactory level.

But the result of the earlier position was that many thousands of the best officers who would certainly have remained in the Service if offered permanent commissions were lost. Some 30,000 applications were received under the original scheme, out of which about 3,000 were offered permanent commissions and about 14,000 extended-service commissions. This type of commission was introduced in order to bridge the gap and retain as many valuable war-time officers as possible against the day when increased numbers of permanent commissions would be available. Many of those granted extended-service commissions have since been granted permanent commissions, but many experienced officers who applied for permanent commissions declined the extended-service commissions they were offered instead, and left the Service.

At present the expiry is in sight of many of these extended-service commissions, and the short-service commissions which later superseded them. The result will be a shortage of officers in the junior ranks, a shortage which it would appear not possible to make up from college cadets and new short-service officers.

For the retention of war-experienced airmen the Bounty scheme, common to all three Services, was introduced early in 1946 with the hope of obtaining some 75,000 to 80,000 airmen. Briefly the scheme allowed for men to stay on for three

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or four years at choice with £25 bounty on acceptance and terminal gratuity at the rate of £25 a year. Provision was also made for Regulars to apply for supplementary service and the entry of war-time volunteers on to Regular engagements. At the same time, aircrew could extend their service, with gratuity, and in some cases this was made a condition of completing training. None of these produced the response desired and some of the results were the varying rates of release for different trades, frequent postings, and the "misemployment" of many officers and men, particularly those formerly on flying duties or flying training, in other trades.

Nevertheless, the Bounty scheme, which is still open, has justified itself: the Service could not have managed without it. By next year "Bountymen" should begin to be due to leave the Service, and then should begin the real test of the effectiveness of long-term Regular recruiting over the past two and a half years. The scheme was intended to tide over the period between the release of war-experienced men and the productive service of the post-war recruits. In the middle of this year a scheme was introduced by which officers and men could extend their service by another year or two years at choice. This suggests that the post-war recruit is not available in either sufficient numbers or with sufficient skill and that there is still a gap to be bridged.

As for the building up of new life in the Service, the problem is fourfold and the pattern now fairly clear. There is, first, the recruitment for officer branches, secondly for aircrew, thirdly under the apprentice and boy entrant schemes, and lastly for the other ground trades.

First, officer recruitment. There are now fifteen officer branches: General Duties, Equipment, Secretarial and Technical branches and the R.A.F. Regiment (the five main branches); the "professional" branches, viz., Legal, Medical and Dental, Education, and Chaplains; and the Aircraft Control, Physical Fitness, Catering, Provost and Marine branches. Methods of entry to the branches vary, but the main avenues are from cadetships, from the ranks, and because of specialist qualifications. Direct entry to commissions as known before the war has virtually disappeared except for the professional branches, and the general principle is that most officers must serve a period in the ranks before being commissioned.

For permanent commissioning in the five main branches, leaving aside the Technical branch, cadetships are available to young men in civil life, to airmen who fulfil several conditions such as age and educational standard, and to apprentices chosen on passing out from their apprenticeships. The civilian candidates have normally to pass the Civil Service Commissioners' Common Entrance Examination, and R.A.F. selection tests which include medical examination and the assessment of personal qualities. Those applying for the General Duties branch have also to undergo flying aptitude tests. Of those finally selected, the General Duties cadets enter the R.A.F. College, Cranwell, the Equipment and Secretarial cadets a wing of the College at R.A.F., Digby, near Cranwell, and the Regiment cadets the Royal Military Academy Sandhurst.

The standard demanded of these cadets is high, necessarily so. There has been a certain amount of criticism of the selection machinery, directed, first, at the standards demanded in particular subjects at the written examination (which have now been modified), and secondly at the assessment of character qualities. Criticism on this score is almost inevitable and there can never be any room for complacency, but several days' planned testing by trained officers should produce a more accurate assessment of character and projection of the candidate forward than would an interview.

The Technical branch stands apart from the other four main branches as having no cadetship system attached to it. In this respect it is more comparable to the professional branches, aiming to draw on graduates and others with comparable qualifications.

The R.A.F. College was only reopened for General Duties cadets in October, 1946, and the institution of Equipment, Secretarial and Regiment cadetships is an innovation. The final numbers chosen for cadetships have never been up to requirements. Similarly, the entry of graduates and the like to the Technical branch has also fallen short of expectations.

Other sources from which it is hoped and intended to draw officers for these branches are from among Regular airmen, particularly ex-apprentices, at a relatively early age, probably between 25 and 30, and from the University Air Squadrons, of which there are at present fourteen in all. A very important source of entry to the General Duties branch, with no pre-war counterpart, will be from enlisted aircrew. As the R.A.F. College is not being enlarged beyond its pre-war size, despite the greatly increased strength of the Air Force, an important proportion of permanent General Duties officers will be drawn from among enlisted aircrew. The aircrew scheme is further detailed below. It is not intended to reintroduce the pre-war system of direct appointment to short-service commissions in this branch. There are no short-service commissions in the Technical branch, but the Equipment and Secretarial

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branches and the R.A.F. Regiment provide for short-service commissions for National Service men and volunteers. A limited number of officers holding these commissions will be eligible for selection to permanent commissions.

Except for the Legal branch, in which all appointments are initially to permanent commissions, the normal method of entry to the professional branches is on a short-service commission with the possibility of selection for a permanent commission later.

Branches which offer short-service commissions to entrants direct from civil life as well as to men doing their National Service are the Catering and Physical Fitness branches. These short-service officers, too, are eligible for selection for permanent commissions.

The Provost branch it is expected to staff from the ranks of airmen police, and the Aircraft Control branch from within the Service.

The short-service officer will hold posts similar to those given to permanent officers during their first years and will have every opportunity of proving himself up to the standard required for a permanent officer.

The short-service commission scheme has obvious advantages to the Service. It fills the junior ranks, for instance, without creating a block in promotion to above those ranks. Many of the officers who entered the Service before the war direct from civil life on short-service commissions proved themselves to be of excellent quality and now hold permanent commissions. But it will be a matter of debate, at least until precise figures are available, whether it is sufficiently attractive to young men at present. Many factors are involved, some of them imponderable, but numbers of young men eminently suitable for commissions are dubious of the wisdom of interrupting their civilian careers for some five years or so with the possibility only of a permanent career and the certainty only of a few hundred pounds gratuity.

A new aircrew scheme has just been announced. Since the end of the war the number of aircrew categories has been reduced from eleven to five, and distinctive titles and badges of rank introduced. The categories are: pilot, navigator, signaller, engineer and gunner, and the term "aircrew" now refers solely to non-commissioned flying personnel.

Recruiting has just opened for all five categories, having been open for pilots and navigators under rather different conditions since February last. The scheme comprises two parts, the one relating to pilots and navigators, the other to signallers, engineers and gunners, but all these volunteers will sign on for eight years' Regular and four years' reserve service in the first instance.

Under this scheme every man who is selected for pilot or navigator training and is considered by the Selection Board to be up to officer standard at the time of his selection will be given at that stage the guarantee of a short-service commission subject to completing flying training and O.C.T.U. satisfactorily. The commission will be for the remainder of the eight years' engagement. Those pilot and navigator candidates who are not given this guarantee—they may be not so completely developed as other candidates and the Board may be in doubt about them—may be commissioned later, and a high proportion of all those holding these short-service commissions will be selected later for permanent commissions in the General Duties branch.

The scheme has only just come into effect, and it is too early to say what results it will achieve. The numerical response during its first week—Battle of Britain Week—was generally heartening. The qualitative response will not become apparent for some time when a representative number have passed through the selection machinery. It was stated that no numerical or percentage limitations were to be imposed on the number of commissions available.

This pilot and navigator enlistment scheme therefore covers three types of young man: those who are, in effect, suitable for permanent commissions, those who are up to short-service commission standard, and those who are, in their personal qualities, only up to airman, aircrew, pilot and navigator standard. The original aim was apparently to commission all pilot and navigator candidates, if commissionable candidates were forthcoming in sufficient numbers, for the official pamphlet states that "the Royal Air Force must have pilots and navigators of the highest quality if it is to carry out its proper role; secondly, that the greater size, complexity and cost of modern aircraft now under development will involve even heavier responsibilities for pilots and navigators and demand increasingly the status associated with commissioned rank." Further, while a high proportion of short-service officers will be chosen for permanent commissions, there is no provision for extensions of aircrew service as such for pilots and navigators beyond their initial eight years.

The gratuity is at the rate of £100 a year for officer service and £40 a year for aircrew pilot and navigator service. For an officer this would mean a gratuity of about £700, assuming that he was commissioned after twenty months' service and training. Airmen who satisfy certain conditions, such as age and educational standard, can also volunteer under the scheme, which, if it meets with the success hoped for, will reinforce not only

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the fighting strength of the Service but help considerably to staff the General Duties branch.

The new scheme differs in several respects from the previous pilot and navigator scheme, which had not been producing the results expected. The period of engagement has gone up to eight years; but, more important, a guarantee (of a commission) is given before a volunteer is attested. This should increase considerably the appeal of and response to the scheme. Under the previous pilot and navigator scheme a man was enlisted with no guarantee but only the possibility of being chosen for a short-service commission after completing his all-through flying training. Presumably there was also under the old scheme a limitation on the number of commissions for aircrew volunteers, since it is now stated that there is no such limitation.

For aircrew signallers, engineers and gunners the scheme is rather different. They will not be eligible for commissions in the General Duties branch, but at the end of their initial eight years may be chosen for either a commission or a ground branch or to extend their aircrew service with a view to pension. The gratuity rate for them is also lower, £32 a year.

It is worth remarking at this point that the Selection Centre through which all aircrew candidates pass is fully alive to its responsibilities and to the man-power shortage. Every candidate is tested for all five aircrew categories, no matter what one he applies for, and his final allocation depends on his suitability, his own preference, and vacancies existing in the categories, in that order. Every effort is also made at the Centre to interest in a ground trade those candidates who are not accepted for aircrew training.

To meet requirements for men in ground trades there are, first, two apprenticeship schemes and a boy entrant scheme, and, secondly, the direct entry for men from civil life to the ranks.

First, the aircraft apprentice scheme, initiated by Lord Trenchard in 1920. Its aim is to provide the backbone of senior technical N.C.Os., but experience has shown that many apprentices are commissionable and a number are chosen at the end of their training for General Duties branch cadetships at the R.A.F. College, a smaller number for a three-year university course in mechanical sciences as preparation for a Technical branch commission, and occasionally for Equipment, Secretarial and Regiment cadetships. In addition, it is planned to select some of them for aircrew duties, and a large proportion of Technical branch commissions will go to ex-apprentices chosen at a relatively early age during their first twelve years' Regular service. Others again will be able to re-engage with a view to pension. The trades covered by the scheme are all in Group "A" (the highest trade group), and are Fitter II (Airframe), Fitter II (Engine), Fitter (Armourer), Electrician, Instrument Maker, Air Radio Fitter and Ground Radio Fitter.

The training lasts three years and is followed by a year's continuation service at specially selected units. The scheme is undoubtedly a sound one: it provides excellent trade, character and physical training, and yet the response, which, pre-war, was always up to requirements, is still falling short. There are no doubt many reasons for this—the total implications of "full employment" have never yet been worked out, economically, industrially, or in any other way—but the success of the boy entrant scheme, which has absorbed some rejected aircraft apprentice candidates, suggests (in view of the high standard in the written examination and generally for aircraft apprentice candidates) that the answer is to be found, at least in part, in the interruption to education and training of the war years. That interruption must be taken very seriously into account in all selection and recruitment problems during the next ten to fifteen years.

The boy entrant scheme is a subsidiary to the aircraft apprentice scheme. It deals with eleven Group "B" trades, less skilled than the Group "A" trades. They are: telegraphist, aircraft finisher, and nine mechanics' trades of airframe, armament, electrical, engine, instrument, air and ground radar, air and ground wireless mechanics. Their training is shorter than for aircraft apprentices, there is no written examination in their entry procedure, and where apprentices sign on for service and training up to 18 years of age and for twelve years' Regular service after that, boy entrants can vary that period of post-age-18 service by recognized combinations of Regular and reserve service, viz., eight years' Regular and four years' reserve service, nine and three, ten and two or, twelve years' Regular and no reserve service. Statistics which would be of value would be those showing numbers and proportions opting for the various combinations. The eight and four might be found the most popular, as boys or parents do not feel that they are committing themselves to too long a period. The boy entrant scheme can supplement the aircraft apprentice scheme in a further respect in so far as those who choose a twelve-year Regular service engagement may, after a period of service, be offered conversion to a Group "A" trade.

The administrative apprentice scheme deals with three trades: general duties clerks, accounting clerks, and equipment assistants. These apprentices are also eligible for selection for cadetships leading to permanent commissions,

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particularly in the Equipment and Secretarial branches. They will also have opportunities to re-engage with a view to pension.

These three schemes are the first and most important approach to the problem of recruiting ground airmen. The most successful in proportion to requirements has been the boy entrant scheme.

As for ground trades in general, they rose from about fifty pre-war to nearly 250 during the war, and number at present about 100. They are divided for purposes of pay and administration into four groups, "A," "B," "C" and "D," "A" being the most highly skilled. The actual trades open to recruiting vary from time to time. The appeal is to men between 17½ and 33 years of age, with or without skill or previous experience, with a few specialized exceptions. No breakdown of figures for the different trades is available, but it is generally understood that the most urgent demands are for the radar, wireless and clerical trades. The number of men who had entered on Regular engagements from civil life between the beginning of the recruiting campaign in April, 1946, and the end of March last was about 32,500.

The response to Regular engagements during the first three months of this year has fallen considerably from the level for the same three months in 1947. The same has not happened to either the Army or the Navy, and the problem appears peculiar to the Air Force.

The periods for which men enlist are for five years' Regular service in the less skilled trades and for fully qualified men in certain highly skilled trades. Normally for the more skilled trades the periods of engagement are eight years' Regular and four years' reserve service, or nine and three, ten and two, or twelve years' Regular and no reserve service.

When the new pay code for all those below officer rank was announced in December, 1945, it was stated:

"In order to improve the long-term prospects of airmen in the higher trade groups and to retain in the R.A.F. the services of many highly trained and very skilled tradesmen who before the war left the Service and went to the reserve in the prime of life, we intend to allow a substantially greater proportion of them to re-engage for pension than before the war. Moreover, it is intended to increase the length of re-engaged service and to make provision for the introduction of long-service engagements up to the age of 50 or even 55, according to trade, subject to the airman remaining proficient and physically fit. We cannot state definitely now the proportion that will be accepted for re-engagement, but it will certainly be substantially higher than it was in pre-war days, and there will be the prospect of a long career in the Service, and a good pension at the end of it."

The whole problem is obviously a very complicated one, and one requiring the agreement of all three Services as well as the Treasury. Presumably, the man-power position within the Service has precluded a solution, but it is a matter which would almost certainly benefit recruiting, and one which should be settled with all possible speed.

For it is a common charge that the Services provide not so much a career for all those below officer rank as simply a long employment period. On the other hand, many men, particularly young ones on whom as fighting forces the Services must concentrate, do not wish to undertake too long an initial engagement. They wish to feel free to change the actual post if they wish, if not even the kind of work. Many young men, certainly the more adventurous spirits, do not envisage on entering a firm or business to stay in that firm for the remainder of their days. It may be that a subtle change is permeating the nation as a whole —it is a view for which much can be said—and that as a nation we are seeking first of all security, that we are now older in outlook during young manhood and look farther ahead. In this respect the scars of the great depression of the thirties are still felt.

A similar point has arisen in connection with officers' careers. Many parents, and young men, are said to be against Service careers because of the danger of an officer being no longer required about the age of 40 to 45, when his domestic expenses are becoming much heavier (children's education, etc.) and his own value in the labour market much lower.

The rates of pay for all ranks have been under considerable criticism of late. The new rates became operative on 1st July, 1946; the cost of living has risen on the official index, and has risen even more taking into account other articles which are not used for the official calculation. Many pressure groups in the civilian community have obtained pay increases, but the Service rates have remained stationary. While it is true that incomes have remained stationary for certain civilian groups, the low Service rate of pay with drops in allowances (as compared with war time) can hardly be justified and is certainly a deterrent to recruiting.

The suggestion has been made in thoughtful and informed quarters that it would be better in every way—efficiency, strength, morale, effort, etc.—to abolish National Service and, instead, raise the standard for the Regular. Lieutenant-General G. Le Q. Martel, writing to *The R.U.S.I. Journal* (August), and representing largely the views of many officers of medium seniority "who

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RECRUITS ACCEPTED FOR THE R.A.F., MARCH, 1947, TO MARCH, 1948.

	1947 Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1948 Jan.	Feb.	Mar.
Permanent Commissions ...	49	595	297	224	202	92	74	71	61	29	25	10	26
Short Service Commissions ...	197	314	667	787	989	366	654	563	568	554	280	207	227
Total Officers accepted ...	246	909	964	1,011	1,200	458	728	634	629	583	305	217	253
Regular Engagements (excluding Bounty) ...	2,705	2,158	2,441	2,035	1,333	997	954	1,856	802	526	829	1,242	649
Bounty Engagements	1,177	943	1,038	957	896	782	784	704	428	328	367	276	240
Total Airmen accepted ...	3,882	3,101	3,479	2,992	2,229	1,779	1,738	2,560	1,230	854	1,196	1,518	889
W.A.A.F. Recruits accepted— ...													
Officers ...	—	—	—	—	—	104	49	56	—	40	—	16	66
Airwomen ...	772	765	1,437	1,197	1,268	1,102	976	1,315	928	522	569	515	685

(Hansard, Lords, 7/7/48). *Note.*—These figures include civilian recruits with or without previous service and those already serving who enter into Regular engagements.

have usually proved to be right in the past," considered that "the more thoughtful officers in the Army are convinced that the solution lies in raising a first-class Regular Army rather than accepting conscription and pampering the conscripts with bedside lights and other amenities of this nature, which seems to be our present policy." A similar opinion is frequently heard expressed among Air Force officers. Hardly anyone, Lieutenant-General Martel points out in his letter, will support the policy of conscription provided that the Regulars can be obtained, but set up a long-term Regular Force with a job for life and a pension at the end of it, and there would be a rush to enlist.

The pros and cons of the conscription argument are matter for a discussion of man power on a wider basis than an account of the recruiting approach, but this matter is worthy of considerable thought: what is the rate of transfer of conscripts to Regular engagements? If it be low, how can it be increased? The conscript can apply to transfer to a Regular engagement; he can apply for a cadetship; he can apply for a short-service commission in one of the various branches; he can apply to become aircrew—always, of course, provided that he fulfils certain routine conditions.

Undoubtedly he finds much in the Service today which might deter him, but the National Service period should be the real opportunity for the Service to sell itself to the conscript, while still maintaining its own efficiency and without any question of bribes.

A possible shortage in the junior officer ranks was mentioned earlier. Would it not be possible to institute commissions for selected conscripts in certain branches? The Army has done so; so far the Air Force only grants such commissions in view of professional qualifications—for instance, in the Technical and Education and Medical and Dental branches. At present the Army is tending to attract the commissionable conscript, and the Air Force is losing him. Not only would he be of actual value during his National Service period but he might easily wish to transfer to a short-service commission, and would in any case help swell the reserve. The institution of such temporary commissions in ground branches would, further, certainly increase the regard in which the Air Force is held (say, by headmasters and parents), and would also help raise morale among National Service men. A start has been made to give some flying training to National Service men, but is limited almost entirely at present to former A.T.C. cadets.

Former cadets, with their pre-entry training, might well be the first to be offered such temporary commissions. It would be an acknowledgment of the value of their training and it must be assumed that their training is of value or the Corps would not be retained. It would, further, help build up the Corps which is struggling to retrieve itself from the unfortunate reputation

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which it gained towards the end of the war and which has not yet been lived down, despite the excellent changes effected by Reserve Command.

These changes, however, do not get to the root of the matter. Yet the Air Training Corps should be the prime field, surely, for recruiting to the Service. The ceiling strength of the Corps was fixed at 75,000 when a cadet had normally a maximum Corps life of three years. That meant an output of 25,000 a year, roughly the R.A.F.'s intake need. At present the Corps is about 50,000 strong. Its members are mostly sufficiently keen to devote a considerable amount of spare time to their training. While not every cadet would be expected to join the R.A.F. as a career, the percentage of recruits from this source should be capable of being raised higher for the expenditure of little more effort and money, and many of them might be willing to take on the short-service career.

The short-service career, however, raises so many other problems of return in civil life (whether service in the Armed Forces should count towards and assist in securing Government employment, for instance) that the matter must be left there as beyond the scope of this article, which has been intended only to describe the pattern of R.A.F. Regular recruiting with some allied matters which could not be disregarded during that description.

E. R. A. W.

Flying-Boat to Water-Plane

By Wing Commander Nigel Walker, R.A.F.

THE flying-boat type of aeroplane has been in use in the R.A.F. for many years and during that time it has fulfilled adequate functions. As a type it has acquired definite advantages in operational capacities, but any extension of these operations has been limited by the inherent characteristics possessed by its airframe and hull in comparison with the virtues of a landplane's fuselage and airframe. In the main, there have been two roles in which the flying-boat has been valuable, those of maritime reconnaissance and of transport. Recently Saunders-Roe have built a successful jet-engined fighter of good performances, but it has not been tried out under operational conditions. There are now symptoms that the flying-boat type of aircraft may be capable of revival in new roles and with an increased performance if it is given better terminal conditions of flight. In fact, it appears to certain prophets that the landplane may be forced to adopt at least one of the attributes of the flying-boat. In order to appreciate the potential of the use of hulled aircraft it will be necessary to examine the existing built-in drawbacks and then to approach the possibilities of new designs from the angle of operating without these disabilities incorporated in the basic designs.

The Service flying-boat cannot compete against a comparative landplane in absolute performance except perhaps in endurance where there is to be an ability to fly slowly for many hours. The main reason for this inferiority in performance is due to the high structure weight that has to be included in the design to meet the basic requirements of operations. This high structure weight is not compensated by a high gross weight until the latter reaches a figure which is far greater than any aircraft we now have in service and which will not have an application until a very high-capacity transport is visualized or a very long-endurance aircraft is required. Such an aircraft would have living quarters and operations rooms on board. The high ratio of structure to gross weight means that the operational, or disposable, load is small and it may become inadequate once the essentials of fuel and crew have been allowed for. In addition the high structure weight tends towards an unwieldy machine even when lightly loaded.

In the case of the flying-boat the cause of some of the bulk has been due to the necessity to ensure that propellers and engines are kept clear of spray that may be thrown up when taxying or planing. This spray is not constant except in calm water, and it can be accentuated by lumps of solid water when the hull is moving fairly fast through a seaway. The bulkiness of the hull in this case increases the vertical dimensions and in order to keep the cross-sectional area as small as possible the designer has to keep to the practical minimum of width. But for all fuselages, whether of land- or seaplanes, there is a minimum

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for a given condition of crew, especially when there have to be two permanent pilots' stations as a start. Added to this cross-sectional area is the need for buoyancy to keep the hull floating. Water can only exert a fixed pressure on the hull, unlike the capability of the tyres of a landplane which can be increased in internal pressure to cope with greater weights as long as the tyre designer can help. So the underwater part of the hull must be of a volume which varies according to the weight of the flying-boat. A tall, narrow hull is obviously not stable and the hull must be balanced upright by outrigger floats either at the wing-tips or in the form of sponsons increasing the waterline width of the hull. Thus basically the flying-boat has bulk.

The hull has to be strengthened to meet conditions when waterborne and this adds to the weight which is carried around in the air without making any contribution to airworthiness. The protagonists of flying-boats always insisted that one of the major factors in their favour was the capability of operating from any reasonably sheltered stretch of water which, they said, covers four-fifths of the world's surface, but is rarely smooth and clear of floating debris. This gospel of open-water operation has persisted in the operational design of flying-boat requirements. During the war it happened that much of the water suitable for flying-boat bases was also suitable for naval and mercantile ships. The result was that stringent regulations had to be enforced to prevent risk of collisions, especially under conditions of darkness and of poor visibility in the day time. Even when these precautions were successful there was always considerable danger from the floating debris that is found on public waterways and which is often massive enough to cause severe damage to the hull of a moving aircraft. Add to these possibilities the laws of Nature which cause waves and swell along the airways and which can easily reach a size capable of transmitting a considerable shock load to the hull during planing. The result is that there must be a reserve of strength in the hull that is in excess of that required to meet the normal loads of take-off and landing and which again is unnecessary in coping with the usual aerodynamic loads.

When the rough surfaces of land aerodromes impeded progress in design of landplanes by causing excessive tyre loading and protracted take-off, the solution was to lay down smooth runways and now these are accepted adjuncts to land bases. In a similar manner it will be possible to maintain a smooth area of water for flying-boats and so this, in turn, will allow a reduction of the strength requirements for the hulls. The method of ensuring smooth water is to enclose a suitable area by means of built-up walls or banks, but it will not be necessary to start with a natural stretch of water. In the same way that canals, ponds and other artificial waterways are made, so can a water base be built and it can be made in one of two general forms, either as a large expanse of unobstructed water or as a system of water runways connected by water perimeter tracks. The construction of such a base will ensure that it is maintained solely for aircraft and thus obstructions will never come on to the surface; in addition, the limited size will prevent normal weather conditions from creating anything except a small ripple on the surface. Thus there is removed the necessity of strengthening the hull to the present extent solely for waterborne operations. But this is by no means the complete extent to which such bases will influence hull shape in the direction of enabling designers to cut down weight and to smooth the shape of aerodynamic efficiency.

The size of a water base would necessarily enable an aeroplane to take off with the same factor of safety as it would enjoy at a land base. But the fact of having a floating body invites the use of an accelerator for take-off. It is comparatively simple to float a hull over a cradle and to lift the whole clear of the water. If the cradle forms the platform of an accelerator there need be little time absorbed in preparing a flying-boat for launching on a line of launch up-wind towards the edge of the waterway. The motive force can be either rocket motors on the cradle, the aircraft engines, some power motor or any combination of them; the waterway will provide an emergency landing strip in case of failure on the accelerator. The use of such a device may even decrease the length of waterway required, because the landing run on water is comparatively short. If such an accelerator became generally accepted for take-off, then it would be possible to dispense with a step on the bottom of the hull. This is used to lessen the surface tension under a planing hull and to allow the aircraft to ride high on the water when gathering speed for take-off. The removal of this step will not only decrease the depth of hull necessary but will also smooth out the hull lines. With the advent of calm water there seems to be no reason at all to perpetuate the step, because there are other devices capable of performing its function; for instance, the hydrofoil or an air scoop are each proved devices which can be retracted easily and are of small weight. A theoretical approach would be to provide three-point suspension as developed for speed-boats.

The use of calm water will have another effect on the shape of the hull; the need for height

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above the spray-level has already been mentioned and this need passes to a certain extent if there is to be no broken water thrown up. The installation of jet engines naturally deletes the airscrews and the complications of their blades becoming damaged in the spray, but allowance must be made for propellers and even for safeguarding the air intakes of jet engines if they are in, or near, the leading edge. A large proportion of the spray, and even more of solid water, thrown towards the leading edges of the wings originates from the chine of the hull flaring displaced water outwards as the aircraft gathers speed. The angle that the planing bottom makes with the side of the hull will influence the angle at which the water is thrown outboard. With a steep planing bottom the spray is flung high towards the engines, but if a flatter bottom is used the trajectory of the spray is controlled outwards and, with no waves to alter its direction upwards after it has been accelerated, it will not rise appreciably. The use of a flatter bottom leads to what is called a light displacement hull which has an increased beam and a decreased draught. The greater planing area becomes permissible with a guaranteed calm-water surface and the increase in beam means, inherently, a greater stability of the hull as well as a decrease in height, and this in turn decreased the upsetting characteristic of the present hull. If the hull becomes wide enough it may need no extra floats or sponsons to detract from its clean lines and so eventually one would arrive at a form of flying wing having the undersurface of the centre section as a flotation hull. That would be possible only on very large aircraft, while Service types will almost certainly need some additional stabilizers but of a size that they can be very easily retracted. The farther forward that the leading edges of the wings are placed in relation to the front of the hull flare, the less chance has the broken water of reaching them, and in this respect there is a divergence from the trend in landplanes.

The provision of smooth water has been the basis for the possible alterations in design of hulls, but before discussion of the problems involved in ensuring such a surface it will be as well to see whether there are additional reasons for using a hull as visualized for operational work. The roles assigned to flying-boats have been partly dictated by the amount of room available in the hull; this has been employed either for passengers or for crew comfort during exacting patrols and detached flights. The military load has been limited by the physical capacity to stow and dispense bomb loads because the customary fuselage bomb bay cannot be fitted into a planing bottom. Bomb load is limited to the area between the wing spars not occupied by fuel tanks or to the use of a bomb track working through a hatch in the sides of the hull. With an increase in hull width it will be possible to provide bomb stowage above the waterline at the sides of the fuselage with an equivalent of the landplane's bomb doors opening vertically instead of horizontally; alternatively, a form of pressure release, as for launching a torpedo, can be visualized. If very large bombs are to be part of the load it will be more difficult to arrange carriage and probably it will always be somewhat easier to load landplanes with these missiles.

The result of the improvement in aerodynamic efficiency of the hull will remove the general qualities of a boat and will probably take away even its resemblance to one. The result will be that no longer could such an aeroplane be called a flying-boat, but instead there will be a reversion to the generic title of waterplane and the relaxation of stringent boatlike qualities will provide designers primarily with aerodynamic problems.

Handling of flying-boats on the water has always been accepted as one of the difficulties that pilots have to contend with in the normal course of their piloting. The difficulties arise because of the varying effect that wind and tide have on the behaviour of the boat and this is aggravated by the fact that the boat can virtually never stop moving when the engines are running. When operating from tideless and currentless waters one of these complications disappears, leaving only the weathercock action of the wind to embarrass the taxying procedure on restricted perimeter tracks and near the docking areas. It is an everyday manœuvre for a waterplane to keep a straight course when landing or taxying into wind, and the use of waterways will present no greater difficulties than do the land runways on an aerodrome; the only difference is that the waterways are rigidly bounded so that swinging to any edge of them is likely to damage the aircraft and that is the main apparent drawback to this type of water base when compared with the open-lake type, but protection can be provided by extended use of a mooring hook on longitudinal wires. There is material enough for a complete article in discussing the possibilities of layout of a water base and here there is room only to state the methods available for providing the main facilities that are non-existent on open-water bases.

Proof already exists of the use of automatic mooring devices which act in the same way as a deck-landing hook picks up the arrestor wire of a carrier. A device of this sort is essential at the end of a waterway to prevent a plane overrunning into the bank. Once the plane is safely moored

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there should be no need for it to manœuvre entirely under its own power until it takes off again. The use of reversible pitch propellers can provide braking and the employment of a guide device will maintain the hull centrally in the taxi track. A guide device will consist of a rigid directional control that is either attached to a tug on the brink or else to a track on the bottom of the taxiway. Transference from the automatic mooring device to the taxying guide will be a matter of practice, and once the plane has reached the area of servicing and arming there will not be any trouble in warping it into some form of dock which will be similar to a land hangar. It will house more than one plane with security and will allow men to work on it without the difficulties experienced on a flying-boat when at moorings. One-way traffic will be the rule in the manner established on land and naturally the same rules of movement will apply. By using waterways for landing lanes the installation of instrument-approach systems is facilitated; these aids are very difficult to install in open-water areas, and even night landing lights cannot be satisfactorily set out permanently in tidal waters where the movement of the water either alters the alignment of the lights or else exposes fixed posts during the ebb.

Calculations have been made of the cost of building a water base and reliable estimates set the price at about the same figure as for a land base of similar traffic capacity. The first one to be constructed will doubtless be more expensive than its successors owing to the experimental work to be put into it. The strength of the actual bed and walls of the runways has been calculated and it can easily be met by normal construction. The water-level can be kept constant by pumping methods in everyday use, and it does not seem to be beyond modern methods to keep the water clean and the waterways clear of the sludge that collects on the bottom of them. Without such water bases the operational flying-boat cannot become economically useful to fulfil anything but a role where performance is of little importance; it can, however, be of use where space is not restricted by the call for speed and where certain risks of non-flying losses are acceptable. If water bases are built there will not be any need to retain the conversion details of boats to aeroplanes and the newer hulls will flourish with the birthright of aerodynamic capabilities. In wars of the future all combat aeroplanes will have to use the utmost of whatever performance is best suited to the role for which they have been specified, and the waterplane will be able to compete with the landplane in all spheres and even lead in some of them when it has an equality of ground-handling probabilities. Therefore there is a present need to study very accurately the full possibilities of using waterplanes and of operating them from adequately equipped water bases.

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SPOTLIGHT ON SHOOTING

The Royal Air Force Small Arms Association

THE most successful Royal Air Force Small Arms Association Meeting at Bisley in June, coupled with R.A.F. successes at the National Rifle Association Meeting and in the Olympic Games, has focused the attention of all ranks on the rising interest in shooting throughout the Service.

At the R.A.F. Meeting at Bisley, held from 5th to 11th June, over 1,200 competitors took part. This was double the number who fired in any previous year and to compete with the increased interest the meeting was extended from five to seven days. There were over 1,170 entries for the Rifle Championships, S.R. (a), and 103 teams competed in the Trenchard Cup (Station) Rifle Team Match.

The meeting rivalled, in size, the annual N.R.A. Meeting held later in the month, and tribute is due to the enthusiasm and capabilities of the Committee who were responsible for the planning and organization of the biggest event so far in the history of small-arms shooting in the R.A.F.

Commenting upon the success of the event at the prize-giving, Lord Tedder said he scarcely thought to see the ranges packed with R.A.F. blue uniforms until he was a very old man, and he went on to say that he knew that it would happen in his time, but added: "I am not quite so old as I thought I would be."

The most interesting event of the meeting was undoubtedly the new Rothermere Shield Competition, which attracted a very large number of competitors.

This trophy was purchased earlier this year to commemorate the generosity of the late Lord Rothermere, who, in 1939, presented a large sum of money to the Royal Air Force Sports Board as an expression of his appreciation of the Service. It is to be held for one year by the station which provides the largest number of individual marksmen whose scores are included in the highest Command aggregate. A miniature silver replica is also awarded to the winning station and a silver gilt replica to the Command Headquarters which enters the winning team. Members of the winning team receive a small replica in bronze.

The conditions of the competition have been carefully considered and drawn up, specifically with a view to ensuring that the greatest possible number of men fire in competitions organized by Commands throughout the country. This is the main object—to decentralize shooting into the Commands—as, in order for a Command to make itself eligible to enter for the competition, and thereby give the opportunity to individual stations to win the trophy, it is incumbent upon the Commands to hold their own full-scale small-arms meetings prior to the R.A.F. Small Arms Association Bisley Meeting, thereby vastly increasing the shooting field for the encouragement of the Tyro shot. Three individual championships must be fired at the Command meetings and the best scores in these championships to count as follows:

S.R. (a): Fifteen best to count.

S.R. (b): Twelve best to count.

Revolver: Ten best to count.

After the Command meetings have been held it is then known which stations within the Command will qualify for the trophy if their Command aggregate proves the highest. At the beginning of the Central Bisley Meeting the position regarding the Rothermere Shield is known in so far as local Command meetings are concerned, the competition is only finally decided after firing for the Command Cup, the scores in which are then added to those previously obtained. The winning Command is the one which gains the highest aggregate score, and the winning station the one in that Command which provides the greatest number of representatives whose scores are selected to make the Command's winning aggregate. The General Committee have made a slight modification in the system for the 1949 meeting in order to reduce the large lead a Command can at present obtain at its own meeting.

This year the Rothermere Shield was won by Bomber Command with a total of 7,982 points. The trophy will be held by R.A.F. Station, Stradishall. Maintenance Command was second with 7,894 points, and Transport Command was third with 7,789. Fighter Command came fourth with 7,745, and Flying Training Command followed with 7,662. Sixth place was gained by Technical Training Command with 7,425, and seventh was B.A.F.O. with 7,099; 90 Group followed with 6,881 points, Coastal Command with 5,793 and Reserve with 5,093. The representative stations were Stradishall (Bomber), St. Athan

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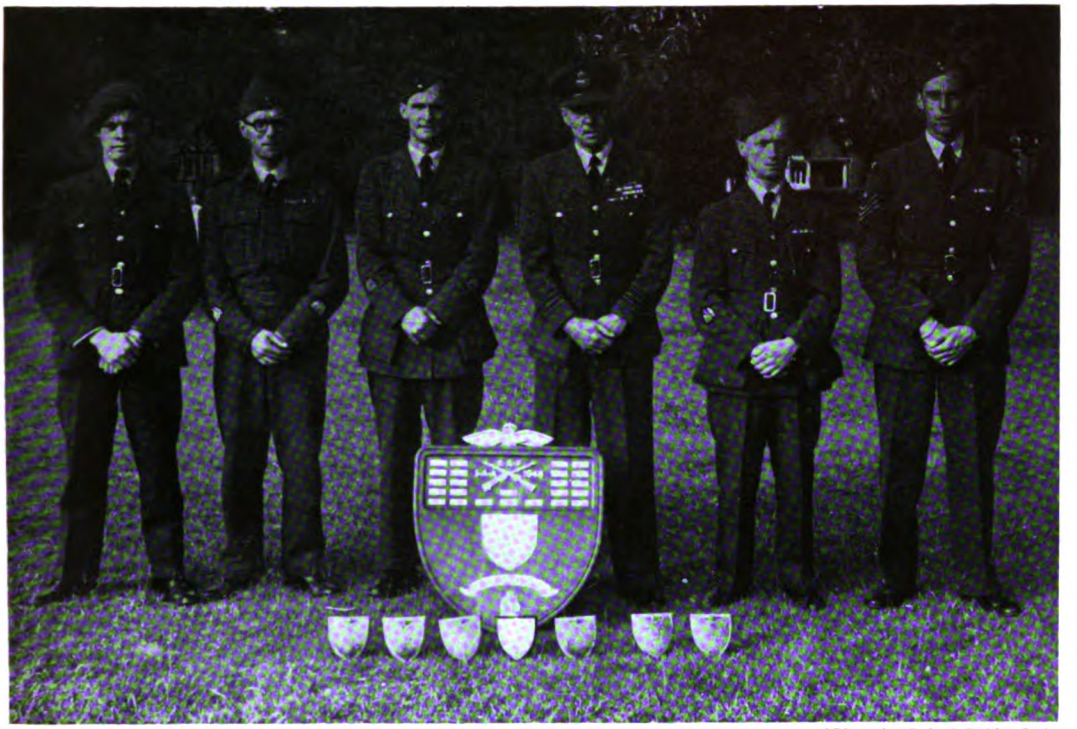

[*Photo by Gale & Polden Ltd.*

The Winners of the Rothermere Shield. The Bomber Command Team from R.A.F. Station Stradishall.

[*Photo by Gale & Polden Ltd.*

Marshal of the Royal Air Force Lord Tedder firing at the R.A.F. Small Arms Association Meeting at Bisley. Sqdr.-Leader C. C. Willott spotting, and W.O. R. Bennett scoring, Sqdr.-Leader Collins, the Association Secretary, is on the right of Lord Tedder.

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[*Photo by Gale & Polden Ltd.*

R.A.F. MEMBERS OF THE BRITISH OLYMPIC PISTOL TEAM (Automatic Silhouette Target) AT BISLEY
On the extreme left is Sqdr.-Leader C. C. Willott. Air Commodore W. E. Staton with the telescope, with Flight-Lieutenant H. A. Steele on his right.

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(Maintenance), Lyneham (Transport), West Raynham (Fighter), Manby (Flying Training), Kirkham (Technical Training) and Watton (90 Group).

Results of the various competitions were as follows:

Tyro Challenge Cup.—1, F./Lieut. G. F. Stubbings (Church Fenton), 112; 2, F./Sergt. Miller (Abingdon), 111; 3, F./Lieut. Smith (Feltwell), 111.

Past Members' and Old Comrades' Challenge Cup.—1, Air Commodore S. Wallingford, 138; 2, W.O. Bertie, 133; 3, S./Ldr. R. F. Strage, 133.

Royal Air Force Auxiliary and Volunteer Reserve Cup.—1, Cadet Pilot B. Roberts, 135; 2, Cadet Pilot A. H. Batstone, 133; 3, Cadet Pilot Carter Jones, 129.

Command Challenge Cup.—1, Fighter Command, 1,202; 2, Transport Command, 1,172; 3, Bomber Command, 1,167.

Revolver Championship.—1, S./Ldr. C. C. Willott, 189; 2, Air Commodore W. E. Staton, 182; 3, F./Lieut. Steele, 182.

Rifle Championships, S.R. (a).—1, S./Ldr. C. C. Willott, 328; 2, F./Lieut. Steele, 323; 3, W./Cdr. Sparks, 320.

Inter-Station Revolver Team Match.—1, Marham, 311; 2, West Kirby, 280; 3, Manby, 275.

Trenchard (Station) Rifle Team Match.—1, Thorney Island, 1,131; 2, Lyneham, 1,127; 3, Bassingbourn, 1,126.

Brooke-Popham-Steele (Squadron) Rifle Team Match.—1, 99 Squadron, Lyneham, 568; 2, 24 Squadron, Bassingbourn, 567.

Revolver Tyros.—W./Cdr. Mills, Lyneham, 88.

Apprentices' Challenge Cup.—"A" Squadron, No. 1 Wing, Halton, 354.

Boys' Rifle Team Match.—No. 1360 Squadron, 336.

Young Officers' and Airmen's Cup.—F./Officer Brierton.

Rifle Championships, S.R. (b).—1, F./Lieut. Dugdale, 138; 2, F./Lieut. Marshall, 137; 3, Sergt. Hazlewood, 136.

The shoot for the Command Cup was watched by the Rt. Hon. A. V. Alexander, Minister of Defence, Marshal of the Royal Air Force Lord Tedder (Patron), Air Chief Marshal Sir John Slessor (President), and Air Commandant Hanbury (Commandant of the W.A.A.F.).

The 1948 meeting was without doubt an achievement and successful from all aspects, and it has done much to popularize shooting and establish the traditions of shooting throughout the Service which have been built up in past years.

In the N.R.A. Meeting the Queen Mary Competition is fired during the Bisley Meeting under standardized Service conditions and is generally accepted as one of the most important events with the Service rifle. This year the first three places were taken by members of the Royal Air Force. Wing Commander W. H. Hampshire was first with 177, Flight Lieutenant H. A. Steele second same score, and Flight Lieutenant H. Gill third with 176. The Bargrave Deane Challenge Cup—another N.R.A. competition fired during the meeting—is open to teams of any unit of H.M. Forces. This year the cup was won by Royal Air Force Maintenance Command, with Bomber Command second.

The first major team success came in 1933, when the Inter-Services Small-Bore Rifle Match was won for the first time. Since that date, 1934, 1938, 1947 and 1948 have been winning years for the R.A.F. The Inter-Services Rifle XX has been won twice—in 1938 and 1939.

The Whitehead Revolver VIII has given the Association its most outstanding success. This most-coveted trophy was first secured in 1939 (1940-45 no competition) and has remained secure ever since—1946, 1947 and 1948.

This year also brought a victory for the United Service Rifle VIII—the first time in the Association's history.

Finally, the Royal Air Force team, representing Great Britain, won the shooting event of the Britannia Shield this year.

Small-arms shooting in the R.A.F. had a small and modest beginning in 1919. The prime mover in those days was the late Squadron Leader J. L. K. Pearce, O.B.E., who was then an Armament Staff Officer on Lord Trenchard's staff. Flight Lieutenant Pearce, as he then was, had previously served in the Army and had been an instructor at the Army School of Musketry at Hythe. He went to great pains to instil his ideas of shooting into the R.A.F. in its early days, and with the help and co-operation of Flight Lieutenant Jackson Taylor, he laid the foundations of the R.A.F. Small Arms Association of today. The first R.A.F. Rifle Meeting was held at Pirbright with the help of the Grenadier Guards—it was a two-day meeting with but two targets, but it was a start.

Squadron Leader Pearce was the prime mover in the formation of an R.A.F. Rifle Association and collected money to build the clubhouse. He nearly wept with mortification when the bank failure of MacGrigors, the Army agents, with whom he had banked the Association's funds (some £800) occurred. The funds being of an association and not privately owned, the R.A.F. Rifle Association only got 5s. in the pound—so £800 became £200 only—a great shock!

Eventually it was possible (with the help of the Royal Air Force Sports Board) to build the existing clubhouse at Bisley, which was opened by the Marquess of Londonderry, then Secretary of State for Air.

The R.A.F. Small Arms Association, which is affiliated to the National Rifle Association and the National Small-Bore Rifle Association, was founded in 1921, and, to quote the terms of its Charter, is "maintained with the object of promoting interest in small-arms shooting for

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Service purposes by means of individual and collective competitions, formed as far as possible to induce practice in methods which will lead to increased efficiency in these arms."

The Association has gone on from strength to strength and the Service has, through the years, produced marksmen of ability and merit to represent not only the R.A.F. and the Services but England in international competitions.

The first notable R.A.F. success at the Imperial Meeting at Bisley came in 1929, when Air Commodore (then F./Lieut.) S. Wallingford won the Queen Mary Prize with a score of 174 out of 200. In 1931 Squadron Leader C. S. Richardson, M.B.E., won the Prince of Wales Prize with a score of two below possible, and Group Captain C. W. Hill won the St. George's Prize. In 1939 Squadron Leader C. J. Collins (now Secretary to the Association) won the Open Grand Aggregate. The King's Prize fell to the R.A.F. both in 1946 and 1947, Squadron Leader C. C. Willott being the first to win the prize for the Service with a score of 280 out of the possible 300. The following year Warrant Officer R. Bennett was the winner with a score of 279.

In August, 1947, British teams took part in the World Shooting Championships at Stockholm. The difficulties of transport and cost had at first seemed insuperable, and it was only because of the efforts of the Royal Air Force in obtaining the use of a Transport Command York aircraft that the British teams were able to take part at all. This was the first time that the Royal Air Force Rifle Association had sent representatives in force to an international meeting; on previous occasions individuals only had competed. A British pistol team at Stockholm, consisting entirely of members of the Royal Air Force—Squadron Leader C. C. Willott, Warrant Officer R. Bennett, Flight Lieutenant H. A. Steele and Air Commodore W. E. Staton (captain)—came third in the World Championship Centre Fire Team Match. This was the only full-bore event in which a British team obtained a place. In the Individual World Championship event running concurrently, Squadron Leader Willott secured fourth place, and in the Free Pistol event Wing Commander J. K. Gallie finished eighteenth using an ordinary Webley .22 pistol.

In the Olympic Games this year the Royal Air Force concentrated on the pistol events and obtained three places out of six in the teams. Wing Commander J. K. Gallie fired in the 50 Metre Pistol event and Squadron Leader C. C. Willott and Flight Lieutenant H. A. Steele both shot in the 25 Metres Rapid Fire Silhouette Competition. Air Commodore W. E. Staton was captain of the teams (he also led the Royal Air Force team in the Whitehead Inter-Services Revolver Match at the 1948 Bisley Meeting).

A great deal of preliminary work took place at the Central Bomber Establishment at Marham. The final selection trials were held there on 18th and 19th June, although most of the candidates had by then put in much preliminary practice. It must be remembered that both these Olympic pistol events were different from the kind of pistol shooting which has hitherto been common in Great Britain. Nevertheless, Gallie was twenty-second in the Free Pistol Match, and in the Rapid Fire event Willott was twelfth and Steele twenty-seventh. Willott's twelfth place was the best obtained by any British competitor in the shooting events of the Olympic Games, not excepting the two rifle competitions. This is the more remarkable in that the members of the small-bore rifle team—all of them N.S.R.A. experts—were firing under conditions similar to their normal practices, but failed to do better than obtain fifteenth place. The future of British pistol shooting is undoubtedly very largely in the hands of those members of the Royal Air Force who fired at Stockholm and in the Olympic Games.

It is interesting to note that, at the National Small Bore Rifle Association Pistol Meeting, the members of the Olympic Games team finished in relatively the same positions as they had done in the Selection Trials, thus doubly confirming their places in the British Olympic team.

The Royal Air Force representatives have been so successful in international shooting that the Chairman has caused a special badge to be introduced to encourage members of inter-Service teams to try to get into international teams. This badge will be awarded to all Royal Air Force members of international shooting teams. The idea was thought of after the meeting at Stockholm last year. Royal Air Force inter-Service team badges were introduced in 1926 and the new badge is similar to them, but is larger and has a lion surmounting the crown in the badge. They will be awarded only to those who are selected for teams which are open to all British subjects.

Much has been, and is being, done today for the Association by its active Chairman of the Central and Executive Committees, Air Commodore W. E. Staton, C.B., D.S.O., M.C., D.F.C. "A great future lies before the R.A.F. Small Arms Association," Air Commodore Staton said recently. "It is now fully realized that shooting teaches accuracy; the same accuracy which is needed in the use of any instrument of precision. If we are to get the best out of the research work and efforts of the scientists, technicians and designers who are today producing 'the tools' we use in the future we must have one hundred per

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cent. accuracy in operation from the air crews and ground staffs. Shooting—be it full-bore or small-bore, rifle or revolver—teaches that accuracy, and the R.A.F. Small Arms Association has this objective before it." Encouragement in the use of weapons can be far more effective if this is conducted on a competitive basis, as opposed to orders to shoot and regular courses as a training duty. This is a psychological fact due to the higher standard of education achieved in the past thirty years.

As Lord Tedder said at this year's meeting at Bisley: "Shooting the rifle or revolver are things which help to make a man fit physically and morally in every way. You cannot shoot straight," he said, "unless you can think straight and act straight," adding that although shooting is rather an individual effort it has the additional valuable factor of bringing out the team spirit.

The Royal Air Force Inter-Service Team Badge

The Royal Air Force International Team Badge

Plans have been laid for future development of the Association. The R.A.F. Clubhouse at Bisley is being renovated and enlarged and it is hoped that next year will see the installation of a caretaker's bungalow and additional kitchen facilities, and the construction of a gun room, showers and members' accommodation, all with the object of encouraging the use of the clubhouse throughout the year. In addition to these immediate plans proposals have been approved, for implementation as soon as circumstances permit, for building upwards on the existing clubhouse for the provision of cubicle accommodation and the extension of existing facilities.

It is intended to start winter small-bore shooting leagues. Hitherto there have been three small-bore classes in the Royal Air Force Rifle Association. These were, firstly, for those using the Winchester or B.S.A. rifle; secondly, for those using the Mossburg; and, thirdly, there was a separate class for the W.A.A.F. The W.A.A.F. has now been incorporated in the Rifle Association and members are eligible to compete in all events. In future there will be two classes only: the first for men and the second for women, although women will also be eligible for Class I. Matches in this small-bore league will be fired at each station under arrangements to be made by the station commander. It is hoped that teams that reach the final will shoot off shoulder to shoulder at a central meeting.

In 1947 the Small Bore Pistol Inter-Station League was started. A silver rosebowl which is known as the VJ Trophy has been presented with the object of encouraging small-bore pistol shooting under N.S.R.A. rules. Matches in the Small Bore Rifle and Pistol Leagues must be finished by March, in order to avoid overlapping with the full-bore, which must start up about that time.

As the Chairman has said, there is a great future before the R.A.F. Small Arms Association and this was borne out by the comments of the President, Air Chief Marshal Sir John Slessor, in his speech at the conclusion of the R.A.F. Meeting at Bisley in June. "This is the best meeting I have ever attended," said Sir John. "Two features," he continued, "stood out prominently. Firstly, the old sweats who were the backbone of the meeting, and secondly the young blood who were shooting for the first time. This," Sir John concluded, "was a healthy sign for the future of shooting in the Royal Air Force."

H. N. C.

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AIRCRAFT INTO BOATS

An Account of the Birth of a Sailing Club

By Wing Commander Bruce Robinson

The Requirement

THE Rhodesian Air Training Scheme was re-opened in October, 1946, some eighteen months after the war-time scheme had ceased to operate actively. The advance party of the new formation found a very friendly welcome in the Colony, but little which could be made ready for the recreation of the air and ground staffs and the cadets who would come to Rhodesia in increasing numbers during the succeeding years.

Worst of all, playing fields had fallen into disuse and returned to their natural state, a mixture of stones, red earth and coarse tufts of grass. It was evident that to create a high morale within the new command a real effort would have to be made to provide recreational facilities. Most new arrivals in the Colony visit Rhodes's grave, a simple, majestic spot in the heart of the Matopo Hills, a rugged range some twenty miles outside Bulawayo. It was when making this pilgrimage that the idea of forming an R.A.F. Sailing Club was born.

The Opportunity

Eighteen miles out of Bulawayo along one of Rhodesia's few fully tarmacked roads a dam has been built as part of the Colony's water conservation scheme. Here, amid tree-lined hills, is a sizeable lake some three-quarters of a mile long by a quarter of a mile wide. This, for landlocked Rhodesia, is a lot of water.

There is a good road from the city, and only a mile from the dam is an hotel. Incidentally, here in the bar is a mural decoration to warm the heart. Beautifully painted squadron badges line the whole room and countless signatures of R.A.F. officers and men, fortunate enough to serve in Rhodesia during the war, provide interest for the newcomer as he searches the names for that of his pal, Joe Soap or Pilot Officer Prune.

But we digress. Not only were there water, a pub and a good road but, on the lake-side, the remains of what could only have been a sailing club. This was, in fact, the once-flourishing Matopo Sailing Club, now, after the inevitable neglect of the war years, little more than a shadow of its former self. A corrugated-iron clubhouse still stood, and around it the decaying hulls of several craft, mainly 20-foot scows. Inquiry later revealed that the club was still officially in existence and the honorary secretary responded most helpfully to the idea of the R.A.F. joining forces to bring about a revival of the pre-war regular sailing activity. In fact, it was not long, as is related below, before the Hon. Secretary of the Matopo Sailing Club and the Chairman of the R.A.F. Sailing Association were together busy spending their Easter Monday cutting out suits of sails for the R.A.F. boats. This joint effort is typical of the reception the R.A.F. received from the people of Bulawayo, whose hospitality and friendship can hardly be surpassed anywhere in the world.

The Project in Embryo

Here, then, was the essential—water within easy reach. Transport would be necessary, boats would have to be built, and a new boathouse and clubhouse would have to be erected. Could it be done? Was there sufficient interest? And what about money?

Inquiries soon showed that there were some forty officers and airmen interested, a sufficiently keen nucleus of prospective members to form a sailing club, and it was decided to make a start immediately, operating on a loan from the Central Fund. (The loan has, it is pleasant to record, since been made good by a grant from the Central Sports Board.) It was decided that to obtain the best value from the enterprise the Club should be organized on an "all ranks" basis and be open to members' wives and families.

The Matopo Sailing Club (by a unanimous vote of its half-dozen extant members) having offered us the use of its facilities—clubhouse, jetty, dinghy and native boatboy—agreed that it would be best to combine forces with the R.A.F. and operate on the water as one unit, the R.A.F. preserving its separate identity for "internal administration." An R.A.F. (Bulawayo) Sailing Association was therefore formed and affiliated to the Matopo Sailing Club. The Association is run by a committee of officers and airmen, including cadets. For financial support the Association depends upon members' annual subscrip-

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The first few off—some of the younger members of the R.A.F. Sailing Club, Bulawayo.

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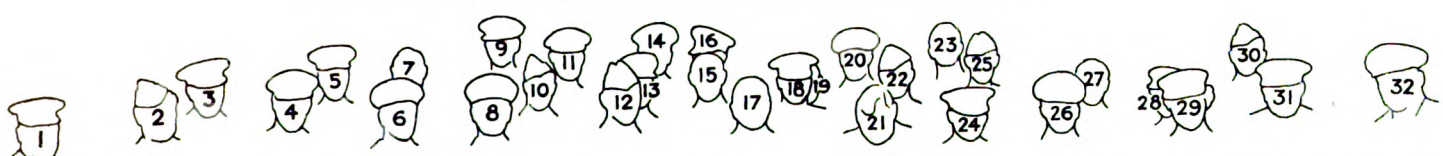
AT THE R.A.F. SMALL ARMS ASSOCIATION MEETING, BISLEY, JUNE, 1948



1. Air Marshal Sir Leslie N. Hollinghurst, K.B.E., C.B., D.F.C. 2. Air Marshal Sir Ralph Sorley, K.C.B., O.B.E. ,D.S.C., D.F.C. 3. Air Vice-Marshal T. E. Drowley, C.B., C.B.E. 4. Air Marshal A. B. Ellwood, C.B., D.S.C. 5. Group Captain R. Silyn-Roberts, A.F.C. 6. Air Marshal Sir James M. Robb, K.B.E., C.B., D.S.O., D.F.C., D.F.C. 7. Mr. Jack O'Leary. 8. Air Chief-Marshal Sir Guy R. Garrod, G.B.E., K.C.B., M.C., D.F.C. 9. Air Vice-Marshal G. A. H. Pidcock, C.B., C.B.E. 10. Air Marshal Sir Brian E. Baker, C.B., D.S.O., M.C., A.F.C. 11. Group Captain J. E. R. Sowman. 12. Chief of Air Staff, the Lord Tedder, G.C.B. 13. Air Vice-Marshal J. W. Baker, C.B., M.C., D.F.C. 14. Wing Commander A. F. Ingram. 15. Major E. G. Monro, O.B.E., T.D. 16. Major Cameron. 17. Mr. A. V. Alexander, Minister of Defence. 18. Lieut.-Colonel T. Sutton, M.B.E.. 19. General Robinson. 20. Wing Commander Stevens. 21. Air Chief-Marshal Sir John C. Slessor, G.C.B., D.S.O., M.C., A.D.C. 22. Group Captain E. H. Hooper, C.B.E. 23. Air Vice-Marshal F. C. Halahan, C.M.G., C.B.E., D.S.O., M.V.O. 24. Air Vice-Marshal E. B. Addison, C.B., C.B.E. 25. Air Commodore L. De V.Chisman, D.F.C. 26. Air Vice-Marshal L. F. Pendred, C.B., M.B.E., D.F.C. 27. Major-General D. P. Dickenson, C.B., D.S.O., O.B.E., M.C. 28. Wing-Officer E. R. Kirkpatrick. 29Air Commandant F. H. Hanbury, D.W.R.A.F. 30. Squadron Leader C. J. Collins. 31. Air Commodore W. E. Staton, C.B., D.S.O., M.C., D.F.C. 32. Air Marshal Sir Alan Lees, K.C.B., C.B.E., D.S.O., A.F.C.

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tions, which range from 30s. for a wing commander down to 10s. for an airman. A charge of 6d. is made for use of boats to cover maintenance.

Choice of Boat

The idea being launched in principle, the next requirement was to be able to launch a boat. The choice of a design was the first consideration. Something suitable to the light airs of an inland water was necessary; simplicity in building, a specification which permitted the use of available materials, and a method of construction which would lend itself to mass production were other requirements. The South African Yacht Racing Association's National One-Design 14-foot Dinghy, known as the "Sprog" class, was finally selected.

The "Sprog" was designed by Helmut Stauch of Pretoria, Herbert McWilliams, who represented the Union in this year's Olympic Games at Torbay, being responsible for its construction detail. The boat, a hard-chine dinghy, embodies many ideas novel to boat construction. It has a stressed-skin hull, the whole of which, apart from the cockpit, forms two large watertight compartments, thus making it absolutely unsinkable and perfectly controllable immediately after righting following a capsize. Frames are of half-inch ply and the hull skin is three-sixteenths of an inch ply, gunwales, chines and keelson are spruce, as are the hollow mast and boom. The total weight of the boat, less sails, is only 220 lb. A "retractable undercarriage" simplifies ground handling and enables the boat to be brought ashore for storage during the week, which is locally necessary, since the Matopos dam contains a waterborne "borer" which, once in the timber, quickly riddles a boat.

Plywood and spruce were the main material requirements, and these were fortunately available at a reasonable cost as a result of the disposal programme of war surpluses. The hollow spruce masts and booms were spindled from spars of scrapped Ansons; turnbuckles, landing wheels, and wire for standing rigging could also be salvaged from the scrap-heap. It was clear that this was the boat, and with "12 off" we could be sure of good sport, even on the restricted water at Matopos. Two further points clinched the decision to adopt the "Sprog": first, the Mazoe Sailing Club, near Salisbury in the north of the Colony, had adopted the same class, and this presented the possibility of inter-club regattas; secondly, with the "Sprog" it would be possible one day to send an R.A.F. representative crew to the annual inter-club regatta held in the Union by the South African Yacht Racing Association.

The Boat-building Programme

Towards the end of 1947 materials were provisioned for the manufacture of twelve "Sprogs." The idea was to prefabricate the materials into twelve complete kits and issue these to boat-building teams, each consisting of a "master boat-builder" and a mate.

It should be said that none of the master boat-builders or their mates had previously built a boat. Against this must be set the fact that all the members of the boat-building teams were "technical" (in the modern sense, *i.e.*, "integrated Eng. Sigs and Arm.").

It was a spare-time activity dispersed over three centres. Of the first eight boats laid down, three were built at Heany, three at Kumalo and two by living-out personnel at the Equipment Depot in Bulawayo. For the prefabrication of these kits the woodworking shop at No. 394 M.U. at Heany was made available. In quick time in December, 1947, twelve sets of frames, gunwales, chines, keelsons, masts and booms were machined. It was then only necessary to assemble the kits, a job similar to that facing the schoolboy who purchases a 2s. 6d. kit for making a model aeroplane. Assembly of the boats started in January, 1948, and the first four (*Snipe, Siskin, Swordfish* and *Seagull*) were on the water on 1st May.

Sail Manufacture

For the manufacture of sails drogues were available. The conversion of these conical jobs into a well-setting sail turned out to be less simple than might be thought.

Sail-making not being recognized as a trade necessary to a modern air force, no expert advice could be gathered "internally." Even fabric workers could throw little light on the art. In Bulawayo, several thousand miles from the sea, the names of Ratsey and Burnham-on-Crouch meant nothing. An empiric approach was the only way. A full-scale plan from the working drawings was laid down on the floor and a prototype mainsail and jib were produced. One commercially built "Sprog" from Port Elizabeth was already in operation at Matopos and her owner, a retired naval commander, loaned this for the trials of our prototype sails. As a result of these trials, and, admittedly, after considerable adjustment, it was possible to cut twelve suits of sails. These, though not approaching the perfect article produced by professional sailmakers, have proved to be adequate both in performance and appearance.

The Clubhouse and Boathouse

This was one of those things which, if the extent of the undertaking were realized at the

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outset, would never be started. In this case, however, a party of eight to ten officers and men, none of whom had any building experience, planned to erect a prefabricated structure using packing cases and some "disposals" trailer bodies. Week-end camps were organized at the dam for these "constructors," with the result that within a few months a boathouse, on submarine-pen lines, was in use, and a clubhouse well on the way towards completion. The "utilitarian" lines of the buildings will eventually be disguised with white paint and thatched roofs, so that they will harmonize with the surroundings.

Transport

The Sailing Association must, it was thought, be independent of Service transport, so an old Ford truck was bought. This, after a spare-time complete overhaul, emerged in a delicate shade of green, its port-side door adorned with the Association's burgee. (This, by the way, is basically a group captain's flag with the three assegais of the Rhodesian threepenny bit superimposed.) The vehicle is a combined personnel-cum-boat carrier with three alternative loads, either "all boats" or "all personnel" or a mixture of both.

The Start of Operations

On 1st May, 1948, some four months after the start of the boat-building programme, the first four boats were launched—not without some trepidation among the so-called "master boat-builders." But all was well, and the Association was in active operation.

It was but a short time before racing was a regular feature of the week-end activities. Many new to the sport were put through the sailing course, and have since qualified as Class "A" helmsmen. Class "A" helmsmen are those who have been passed as fit for solo, Class "B" helmsmen being qualified to race. The issue of "Pilots' Notes" for the "Sprog" was found to be a good method of making the handling characteristics known to inexperienced helmsmen. Naturally, there were "prangs" during instruction and certain wives have on occasions, after a capsize, been seen to emerge somewhat bedraggled from the dam. This inland water is, however, an ideal "nursery" where little harm can come to crews or boats.

Maintenance

After some weeks of operation it was realized that to build boats was one thing, but to maintain them another. A "maintenance plan" was clearly called for and this provides for one boat to be off the water each week-end, for members to work on while not sailing. A "periodical inspection schedule" will eventually be evolved. First- and second-line servicing is done at the dam, while for third- and fourth-line work the boats will be taken back to the Association's workshop at Kumalo, the Group's Headquarters at Bulawayo.

Future Development

As the remainder of the Association's twelve U.E. boats take the water so will the membership be increased. Arrangements for "night stopping" at the dam are planned and this involves a catering organization. And so from small beginnings the Association hopes soon to have created not only a source of recreation which will be of lasting benefit to the R.A.F. in Rhodesia but a place where many will gain a lifelong interest—the love of small boats.

BENEVOLENT FUNDS

R.A.F. Quarterly contributions to the Benevolent Funds of the Commonwealth and Empire Forces for the October, 1948, Quarter

		£ s. d.
The Journal's Donation		21 5 0
		£21 5 0
R.A.F. Benevolent Fund	£11 5 0	
R.C.A.F. Benevolent Fund	3 10 0	
R.A.A.F. Benevolent Fund	2 10 0	
R.N.Z.A.F. Benevolent Fund	2 0 0	
S.A.A.F. Benevolent Fund	2 0 0	
		21 5 0
Brought forward		964 15 10
Grand total contributed to date		£986 0 10

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The CONFESSIONS of a "PENGUIN" . . .

Introducing a "Penguin"

THE Royal Air Force rank titles have brought complete confusion of mind to Aunt Matilda. Everyone she sees dressed in R.A.F. blue is "an airman." To her "an airman" is one of those brave young men who soar up into the sky by night and by day and of whose daring and valour she reads in her newspaper daily.

To explain to her that some airmen are "ground wallahs," that many Flying Officers have not flown and never will fly, that numerous Pilot Officers are not and never will be pilots, and numerous Squadron Leaders have never led a squadron or Wing Commanders commanded a wing, only reduces her to a state of greater perplexity.

Whether the Air Ministry will give more appropriate titles to members of its Air Force one day is a matter for speculation, but in the meantime Pilot Officer Prune and his "Pilot Boys' Union" have settled this matter for themselves.

As Cæsar divided Gaul into three parts, they have divided R.A.F. officers similarly. To them they consist of:

(*a*) "Pilots."
(*b*) "Penguins."
(*c*) "Wingless Wonders."

There is not the slightest intention of disrespect in this arbitrary division. They have, in fact, a sound reason for each title. Although these titles are not likely to be adopted by the powers-that-be, for the moment they suffice.

A "Pilot" is clearly one who takes charge of an aircraft and pilots it in the skies above.

A "Penguin" is one who, although wearing wings and may have been able to fly in the dim past, is now "earthbound" and struts around with an air of great importance, like the quaint little bird he is named after, or, when not doing this, appears lost in reflection upon the days when, with quite inadequate wings, he soared into the skies above him at great risk to himself and everybody else.

"A Penguine is one who, although wearing wings . . . is now earthbound . . ."

The "Wingless Wonder" is applied to one who, although dressed similarly to a pilot, never has been blessed with wings, and "stooges" around on the ground doing all kinds of incomprehensible jobs, such as organization, administration or intelligence, all of which remain a sealed book to a poor pilot boy.

The following episodes concerning the flights of a "Penguin" have been written for the entertainment of anybody and everybody, but in particular for the pilot body. They are reminiscences of a nobody.

Learning to Fly

"He flies through the air with the greatest of ease,
That daring young man on his flying trapeze."

During my twenty years as a pilot I had much in common with that daring young man about whom the above-quoted popular song was written. It was equally essential to both of us that there should be nothing in our path of flight if we were to continue to "fly through the air with the greatest of ease." Also, with all due

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modesty, I claim that there was equal daring in our respective performances.

For years I had a lot of trouble with my flying.

My own opinion, for what it is worth, is that my average of "breakages per hour flown" was unduly high owing to lack of initial instructions.* Whether flying is a game of skill or chance I am still uncertain. The fact that I am still flying makes me believe that there is definitely an element of chance in it.

It is essential that at least an outline of my training as a pilot should be known, so that the extent of my knowledge of aviation, when faced with a difficult situation, can be fully appreciated. My instruction was outstanding in its simplicity. I was not asked to study "The Theory of Flight," neither was I told why the innumerable combinations possible between the throttle, elevator, ailerons and rudder caused the aircraft to react in a known manner. I was shown, by demonstration in the air, what reactions might be expected from the aircraft in normal flight when the controls mentioned were in certain positions. My aim was to memorize sufficient of these various combinations to enable me to take off, fly in a direction chosen by myself and not the aircraft, and to land it without breaking it.

After persevering for twenty years I am beginning to believe that one day I shall be sufficiently familiar with the idiosyncrasies of aircraft to take one off without risk to others, retain more or less complete control of it in the air, and land it with a reasonable element of safety. I should add that of navigation, engines, rigging, meteorology, flying regulations and aerobatics (except those which are involuntary) I know nothing.

The conversation that took place on my first day's instruction when we were both seated in the aircraft was something as follows:

"Can you hear me?"

"Yes."

"Have you done any piloting before?"

"No! I know nothing about it."

"Oh, hell! Never mind; you'll soon get the idea. I'll control the throttle, so don't touch it."

"I wouldn't recognize it if I saw it."

Laughter came down the speaking-tube.

"Fasten your safety belt. We're off. I'll give you the 'feel' of the controls when we are in the air."

"All right; I'm ready."

After we were airborne and well above the aerodrome the conversation recommenced.

"Put your feet lightly on the rudder-bar and take hold of the stick. Now I want you to try and follow the movements that each makes when I turn to starboard." He did a steeply banked turn to the right.

"Did you get that?"

"Yes. The rudder-bar seems to work like that in a boat."

"It does for mild turns, so you have learned something already. What did the stick do?"

"You seemed to be stirring an invisible Christmas pudding with it." This brought unintelligible mutterings from the other end.

"We will try something simpler. Try and fly on a straight and level course. Push the stick forward to push the nose down, pull it back to pull the nose up. You know all about the rudder." That last remark was typical of my instruction!

I had grasped that in level flight if you pressed the right-hand end of the rudder-bar the nose of the aircraft tended increasingly to turn in that direction. My instruction therefore on the use of the rudder was complete. (Shades of past pilots shudder.) When the reins were placed in my hands the aircraft immediately became a hard-mouthed horse and I had very little control over it.

Weeks and then months passed and I was still trying to follow what the stick did in taking off, turning and landing. Sometimes I nearly grasped the mystery, at others the aircraft did exactly the opposite to what I had expected. One afternoon, after I had made two consecutive landings without my instructor having to shout "I've got her," as he skilfully staved off an impending crash, he taxied back into wind ready for take-off and then proceeded to climb out.

"Make one circuit of the aerodrome and then come in and land. Best of luck."

I grinned back. This was my first solo, always a thrilling moment for potential pilots; mine was going to provide a thrill for quite a number of people. In taking off I saw with some anxiety that I was not high enough to clear the hangars at the far side of the aerodrome. I think the aircraft realized it also, for it gently swung its nose so that it flew between two of them, and the wings cleared the tops of the hangars on each side by a few inches. All those working within came out to see who was "crazy flying." I did my circuit and then got into position to land, closed my throttle and then proceeded to glide earthwards. When I reached the edge of the aerodrome where my wheels should have gently touched down, I was twenty feet or more too high. This perplexed me.

*It is necessary to explain that my training as a pilot was unique: having flown as an observer in the last war, being over thirty years of age and allocated to the R.A.F. for staff duties, it was not considered necessary to send me on the proper course that every other potential pilot is given. Such courses are very thorough and cover every aspect of flying. I was not sufficiently fortunate to receive this orthodox instruction.

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After that everything happened very quickly. I pushed my stick forward and immediately my speed increased to 70 miles an hour, making the wires hum and whistle. The main road which ran through the middle of that aerodrome came into view, my wheels struck the ground this side of it and I bounced high enough to have cleared any vehicle on the road. The next impact with the ground was over the road and too much for even the stoutest undercarriage. It collapsed. There was a horrible tearing and splintering noise and then I found myself hanging upside down. I undid my safety belt and promptly fell on my head, which gave me a foul headache all that evening. Nevertheless, I had completed my first solo flight.

The ambulance, fire tender and a small crowd of airmen were soon on the site. I was destined to witness this familiar scene on many occasions in the future. It was a disappointing affair in many ways. I realized how easy it was to make these slight errors in judgment, and with my sketchy knowledge there was going to be an element of risk in my flying. But, never mind; "what goes up has to come down."

Soon after this episode I was sent to the R.A.F. Station at Kenley, where I was to complete my qualification as a pilot when I had learnt to fly a "Service type" aircraft. There my instruction continued on the same simple lines as before.

The change from flying "trainer aircraft" on an aerodrome all to myself and the "Service type" on a busy flying station was rather like riding a bicycle round your private carriage drive and then being expected to drive a powerful sports car through London traffic.

Each flight was an adventure which never ceased to give me a thrill. Yet despite this I seemed to have no natural aptitude for piloting. The reason, I think, was lack of basic training in the principles of flying and details of the construction of the aircraft and engine. It was several weeks before my instructor touched on the subject of my going off on my own. Leaning forward across the desk he offered me a cigarette.

"Thanks."

"Well, you old stiff, when are you going to improve your landings?"

"I land quite well at times, but I'm a bit inconsistent."

"Exactly! You do two decent landings and when I ask you to do one more before I send you off on your own you proceed to do something perfectly bloody."

"I think the fact that you are sitting behind me worries me. I expect that sudden shout, 'All right, I've got her!' to come just when I'm landing and it's distracting."

"I hope you're right. You seem full of confidence. I don't think you realize the ghastly things you do at times."

"Where ignorance is bliss . . ." I grinned at him. "Well, what about my solo?"

"All right, come along. If you can do one of your better landings this time round I'll let you try on your own."

I not only went off solo but after three permissibly small bounces found myself back in front of the hangar with the aircraft still all in one piece. To my disappointment I found my instructor had not watched my performance. As the Adjutant unkindly put it:

"Horace is sitting in the Mess with his head in his hands, waiting for the phone to ring; you've reduced him to a nervous wreck."

"Oh, is he? I'll phone him—pass it across."

Almost immediately I heard his gloomy old voice: "Well, what is it?"

Imitating the Cockney Flight Sergeant, I replied: "J400, sir! A-doin' of low acrobatics without permission, sir! Lumme, you should a-seen it, sir! Slow rolls at 200 feet, sir, then a-loopin' off the deck, sir!"

"It can't be J400, Flight: a pupil is just doing his first solo on that."

"Well, for cryin' out loud! It was J four 'undred, sir—he's just taxying in!" Then I laughed. "Well, if it wasn't as good as all that, it was still worth watching."

"You old bograt! So you're down! Sorry I couldn't face watching it; I've a good mind to go out and get drunk. Come and join me?"

"I'm on my way."

"We'll just get up to Town in time for lunch. I'll pay for one at the Savoy: you've earned it."

* * *

The following day I was sent up to practise "circuits and bumps" on my own and met with my first really bad luck. The strong wind necessitated my taking off over the hangars. My first landing was a very fast one and half-way across the aerodrome my tail was still airborne and I was rushing towards the hangars at about sixty miles an hour. An alarming situation for a novice, and, although it seemed to be taking a terrible chance, to me there was only one thing I could do. I opened my throttle wide. With a roar of engine I rose over the top of those hangars. Luck was undoubtedly with me, and I felt a good deal of relief. Perhaps I had not touched down far enough away from the hangars. Next time I used all the run available. Yet again with tail well up that "blue-pencilled" aeroplane showed no signs

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of stopping its wild career towards disaster. I saved myself again by giving my engine full throttle and just skimming over the hangars. Twice more I tried, with the same result. By the groups dotted around the aerodrome my attempts to land were being watched by a large number of people and I saw the drivers of the ambulance and fire tender moving their vehicles on to the aerodrome. I'm sure with kindly intentions, but it gave me rather a cold feeling in the stomach and I felt very lonely careering about the sky alone.

The problem was too big for me. I was doing everything I had been taught and yet I was in charge of a runaway aeroplane. It was quite clear where its run was going to end and I had no intention of being with it when it entered that hangar. This time, as I came in to land, I undid my safety belt. The moment I had landed and realized that there was no change in its behaviour I left the controls and sat on the edge of the cockpit. After crossing three-quarters of the aerodrome like this, whilst still doing about forty miles an hour, I "abandoned ship." As I was in the middle of about my third somersault over the ground I heard a sickening crash.

When I came out of hospital, at a subsequent inquiry it was found that "the throttle barrel had jammed and therefore the throttle was not closing properly." I was also asked why on earth I had not switched off the engine. It hardly seems credible, but the idea never even occurred to me.

* * *

The period that followed was one long chapter of accidents. Nothing serious. The airmen started a moneybox and pupils were expected to pay small fines for careless breakages. From memory they were two shillings for damaged wing-tips, one shilling a broken tail-skid, half-a-crown for damaged elevator or rudder, and the same price for bending an undercarriage. Complete write-off of an aeroplane cost ten shillings. I contributed to that box with great regularity.

Nevertheless, I was gaining experience. Every day I felt more confident that I would soon be wearing the coveted pilot's "wings." I recovered from my unlucky spell and for a whole week gave satisfaction in several of the necessary tests. There soon remained only one to complete my qualification. A cross-country flight with a passenger.

This had been arranged for ten o'clock the next day. It was a crisp winter morning with bright sunshine, and dressed in warm flying clothing I was waiting for my passenger when the Flight Commander strolled across.

"The course is from Kenley to Manston, where you land. Make your return trip after lunch."

"I shall find my way all right, as I've motored there by road several times. I also know the aerodrome, as I learned to fly 'trainer' aircraft there."

"That's why I've chosen it, laddie. I'll give you a more difficult one when you haven't a passenger. . . . Flight Sergeant, whom did you detail as passenger for this trip?"

"L.A.C. Smithers, sir; but it's odd, nobody can find him." Then suddenly seeing the fitter of the aircraft he called out:

"Corney, get some flying kit. You can go as passenger instead of Smithers."

The airman wandered towards us and said something to the Flight Sergeant in a very husky voice.

"What's that? Got a sore throat? When did you get it?" Another hoarse whisper came in reply.

"Just come on? That's queer. You'd better report sick."

All the airmen seemed to have mysteriously vanished from the locality, except one who stood against the hangar with his hands in his pockets, gazing with admiration at aircraft landing and taking off. The Flight Sergeant hailed him.

"Hi! You come 'ere."

The airman walked briskly across.

"Yes, Flight?"

"What are you supposed to be doing?"

"Just arrived 'ere and told to report back to the orderly room at eleven."

"What's yer trade?"

"Cook, Flight."

The Flight Sergeant looked at the Flight Commander. "Very valuable things, cooks, sir."

"Would you like a flip?" The airman's face beamed.

"Rather, sir!"

The Flight Sergeant took him by the arm and smiled paternally at him.

"Come with me and I'll lend you some flying kit."

When they returned I climbed into the front seat and my passenger settled himself behind me. The Flight Commander climbed on to the side of the aircraft, pulled the side of my helmet open and shouted in my ear above the noise of the engine:

"If you're tempted to 'abandon ship,' remember you've a passenger."

I grinned and hoped that this tactless jest had not been overheard by my passenger. When I looked back he grinned, so obviously the remark had passed unheard.

The journey down was uneventful. My landing was good and my passenger climbed out of the aircraft in a cheerful and confident manner. A very old friend of mine took me off to lunch.

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Returning to the aerodrome about half-past three I was met by the Station Commander.

"The weather has deteriorated and it's snowing in several places. I don't think you ought to leave."

"But look at the visibility here: you can see for miles."

"Yes. But local snowstorms blow up in a very few minutes. It's not worth risking, unless you have experienced a good deal of bad-weather flying, of which, of course, snow is the worst."

"Well, what about an early cup of tea and then checking up the weather again?"

"All right; and if it's still clear at Kenley and fine here I'll let you take off."

After tea there was no change, so on the distinct understanding that if I ran into bad weather I would return to Manston at once and not try to fly through it, I was allowed to take off.

A bitterly cold wind was now blowing and I think my passenger was as anxious as I was to get back to a warm fire. Flying in an open aircraft was a bit Spartan in winter. My take-off was not very professional as I waved farewell to the C.O.; I never could do two things at the same time. By the aid of the railway lines and well-known roads, I turned the nose of my aircraft for Kenley. At 2,000 feet visibility was still good. After flying for about half an hour I saw a sort of cloudy pillar in the sky south of me, and thought: "Ah! Local snowstorm," and forged ahead a shade faster to try to reach my destination before it came any closer. Without any warning I suddenly found myself flying through snow. In less time than it takes to write it, my windscreen was completely snowed up and so were my goggles. The earth beneath me had disappeared entirely. I might as well have been blind. I could see nothing but snow.

A push in the back made me glance round and I saw my passenger vigorously pointing behind us. Either he had heard of my promise to the C.O. or he was passing a vote of "no confidence." I held up my disengaged hand with the "thumbs up" sign to show that I agreed with him. Unable to see anything except blurred objects close to me and beyond that snowflakes, and with absolutely no sense of direction, I judged as nearly as I could a turn that would take us back to Manston and also out of this blinding snow.

In those early times there was not the mass of ingenious instruments on the dashboard to show the poor pilot whether he was on an "even keel," side-slipping, or even upside down when in a cloud or when vision of earth was obscured. The "boffin" was a rarer bird in those far-off days and consequently the "gremlins" were able to play their mischievous tricks on pilots in distress more often than they can today.

"The 'Boffin' was a rarer bird . . ."

If the uninitiated wish to get some idea of the circumstances, the next time they are roaring along in a tube train, if they shut their eyes firmly, imagine their coach is suspended 5,000 feet above the earth, their hands and feet are frozen, they do not know which direction of the compass they are proceeding at a hundred miles an hour, that unless the darkness lifts to show them some suitable place to land their noisy conveyance, when the petrol runs out it will rush earthwards at high speed, the result of which does not bear thought, then they will get some idea of what I and my passenger experienced for the next half an hour.

Very soon becoming fed-up with this and feeling that we ought to be about over Manston again, I cautiously descended to try to get a glimpse of the ground. After gliding down and down without seeing anything, I suddenly caught a glimpse of something below and uncomfortably near the aircraft, and I opened my throttle and pulled the stick back. I was only just in time to prevent our diving into the sea. Now the question was: "Which sea?" Was it the North Sea or the English Channel? The important thing was that

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I was much too close to it for a novice, so I climbed up to about 1,000 feet.

I could still see nothing but snow, and, to make matters worse, it was now getting dark. As we had come from land to sea, it was reasonable to suppose that land was behind, so once again I did as nearly as I could judge a complete turn and flew back along the course we had come. At this point in our adventure I began to feel lonely, rushing through blinding snow at ninety miles an hour to "nowhere in particular," with the light failing rapidly and possibly the petrol as well, the sea below, and the land heavens knew where. I was not only lonely but getting nervous. What did my passenger think about it? I wondered. A quick glance behind left me still in doubt. Was he gloomy, fearful or merely bored? It was difficult to judge from what I could see of him, huddled up in flying kit and behind large goggles that left him expressionless. Anyway, his general appearance gave me the impression that he was dejected, so I grinned encouragingly, but got no response.

Then our luck suddenly changed—and none too soon. The snow practically ceased and shortly afterwards land came in sight. I cautiously came a little lower and in spite of the poor light at once recognized the Isle of Sheppey. I realized that there was an aerodrome somewhere below me, and although it was strange to me I determined to try to land on it. After circling round dangerously near the ground for one so inexperienced, I was able to pick out the hangars and the aerodrome. After what we had been through the fact that I had no idea of the wind direction seemed a matter of little importance. Flying in a line parallel to the hangars, I shut my throttle and glided down into that darkness at a steady sixty miles an hour. The ground appeared very suddenly. I flattened out, bumped and rose into the air momentarily, bumped again and then rushed head-on into the rifle butts.

My passenger was really unlucky. He was thrown clear and landed undamaged on top of the butts, but he had the misfortune to fall from there back into the range below, where he broke his arm and damaged his head.

I was lucky enough to get away with a few cuts on my face and a lump on my forehead the size of a hen's egg. The usual crowd were soon on the scene. The aircraft was beyond local repair and one would have thought that the ghastly experiences of the past two hours or more would have had a depressing effect.

On the contrary, I remember whistling as I walked across to the Mess to phone my Flight Commander and tell him where we were. The cause of my jubilation was that I had carried out a cross-country flight with a passenger and the last of my tests had been completed. Except for a few paper formalities I was now a fully qualified pilot. In the darkness I could almost see the ghost of those "wings" on my left breast.

A. H. S.

The Royal Air Force at Olympia

By P. B. Fox, M.B.E.

THE question of what form R.A.F. participation in the Royal Tournament is to take must be one that has caused great discussion among those responsible for arranging for the item. It is manifestly impossible, within the narrow limits of the arena at Olympia, to show the Royal Air Force performing its true functions, *i.e.*, flying aircraft in the air, or even to evolve a "turn" which will give a true picture of all the many and varied activities carried on within the Service. This is more easily accomplished on an aerodrome itself at a station "at home." For this reason participation in the past has usually been confined to displays of physical training and precision drill with arms, both excellent examples of their kind, but not large enough in their scope.

For the first post-war Tournament, held in June, 1947, it was again decided to combine physical training with ceremonial drill. That year 128 pupils of the Royal Air Force School of Physical Training performed physical exercises and maze-marching accompanied by the Central Band of the Royal Air Force, and well deserved the applause evoked by their perfectly synchronized movements.

There is always something about well-performed drill or, in fact, mass movement of any kind that appeals to the onlooker, just as there is always great personal satisfaction to be obtained from taking part in it. The second half of the display consisted of elementary and ceremonial drill and the traditional ceremony of lowering the Colours, performed by airmen recruits of the advanced drill course, accompanied

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[*Photo by Keystone*

The Royal Tournament, 1948. H.M. The King inspects the Guard of Honour mounted by the R.A.F. Regiment. It is interesting to note that this was the first ceremonial occasion on which members of the R.A.F. wore the Campaign Stars and Medals of the 1939-45 War.

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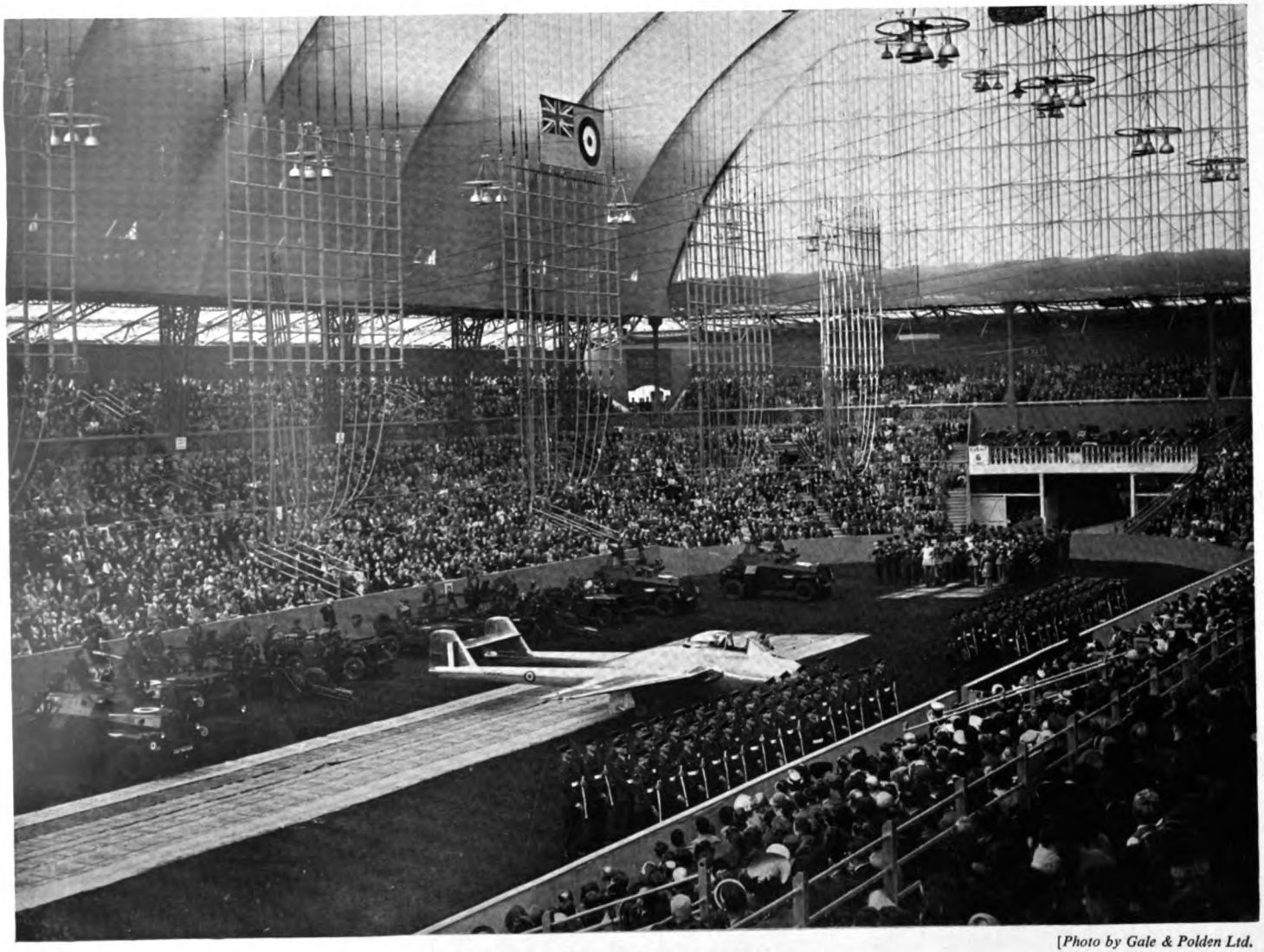

[*Photo by Gale & Polden Ltd.*

THE ROYAL TOURNAMENT, 1948
The Royal Air Force Display.

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by the Aircraft Apprentices' Pipe Band and Trumpeters from the Royal Air Force, Halton. The band was led by its well-known goat mascot, who marched and carried himself as well as any of his human comrades! This part of the display was intended to show in brief the training necessary to reach the high standards both of drill and turn-out demanded by the Royal Air Force. When one considers that the advanced drill course for airmen recruits is only of eight weeks' duration and that the apprentices' band is a voluntary one composed of apprentices undergoing three years' technical training, the results speak volumes for the work of the instructors and the enthusiasm of the musicians. The applause was again well merited.

For the 1948 Royal Tournament a complete break with tradition was made and, instead, the organizers attempted to show the public some of the war-time work of the R.A.F. The scene was entitled "Establishing a Forward Airfield" and was carried out by Transport Command with combatants and their equipment from the R.A.F. Regiment. The responsibility for the display rested, in the main, on Transport Command Development Unit, which is stationed at Brize Norton. For a brief description of the scene we must turn to the programme:

"The display represents a typical Air Force operation in jungle country. The land forces are advancing against a slowly retreating enemy. The Air Force is wanted for the maintenance of air supremacy over the whole area covered by the advance; for bombing and strafing the enemy airfields to keep their air forces out of action; for reconnaissance for the army commanders and for the supply of food, equipment and ammunition to the land forces—big responsibilities which only the Air Force can take. For these tasks the Royal Air Force must have bases very close behind the advancing army. . . . You will see how the R.A.F. Regiment secures an area selected for an advanced airfield, how the first airborne supplies arrive and how the airstrip is laid to take the first of the fighter squadrons."

Having read the foregoing we are now in the picture; the end doors of the arena open and in marches the Royal Air Force Band, playing lustily, but quite unable to compete with the burst of applause which greets its appearance. The Band disappears through the opposite exit and the lights are lowered. Uttering shrill cries, a band of figures appear, dressed in light khaki drill with curious helmets on their heads, who throw themselves on to the tan of the arena and open rapid fire with their rifles. One guesses instinctively that these are the "disgusting Nips." Meanwhile the opposite doors open and one sees advancing in battle order a group of the blue-clad R.A.F. Regiment, who, met by the withering Jap fire, fling themselves down and open fire on the enemy, aided by armoured cars which race in and quickly overcome enemy resistance.

Two jeep-drawn Bofors guns appear, are brought speedily into action and fire a round each, the wounded of both sides are recovered from the arena and a party of men appear. The Bofors guns are brought out of action, limbered up and brought into action again with commendable speed, facing the Royal Box. The roar of an aircraft is heard and an arc light focuses on the roof of the Olympia building. All eyes turn roofwards and there we see a model of the Hastings transport plane slowly traversing the arena. From it drops a small jeep supported by statichutes and small containers of supplies. Following the Hastings comes a Hamilcar glider, the announcer informing us that it carries men and equipment, and as the limelight leaves it the end doors again open and the nose of a glider appears, opens and emits a stream of men, who quickly lay the airstrip down the centre of the arena. Then two jeeps, equipped with landing lights, slowly drive up the airstrip and line themselves up facing the Royal Box. A shrill scream fills the air and once more the limelight sweeps the roof, disclosing to our gaze a scale model of the De Havilland Vampire, which, in its journey across the roof, represents the fighter planes which are to use the airstrip. The sound of music is heard and the Royal Air Force Band appears heading a column of airmen attired in service dress with white belts, their rifles with bayonets fixed, marching with machinelike precision. As they pass it the column splits into two squads, halts and turns to its left, facing the Royal Box.

And now all eyes turn to the entrance doors which have again opened to admit a real Vampire with folded wings. The pilot slides back the hood, lowers the wings and taxis up the airstrip until he enters the space behind the rifle squad and in front of the armoured cars and Bofors guns.

He swings his plane round to face the Royal Box and leaps lightly to the ground. Simultaneously the officer in command gives the order "Present arms," the Royal Air Force ensign, floodlit, descends slowly from the roof, and the Air Chief Marshal taking the salute rises in the Royal Box to face this brilliant tableau and the storm of applause which sweeps the arena.

That the item was popular there can be no doubt, and we sincerely trust that the organizers will cast around for other and even better ways of displaying to the public something of the many and varied activities of the Service.

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NEWS SUMMARY

AN HISTORICAL EVENT

ON 6th July, 1948, H.M. The King presented his Colour to a sergeant cadet at the R.A.F. College, Cranwell. This was the first King's Colour to be presented to the Royal Air Force, and therefore a traditional event in the history of the R.A.F. In His Majesty's address to the cadets he said: "The way to the stars is not easy, and it is only by application, hard work and devotion to duty that you will reach the heights. By its daring, for its efficiency and through its sacrifice, the Royal Air Force has won renown throughout the world. It has proved itself our shield and spearhead in war. It stands today as a guardian of peace." Although this address was at the time made to young cadets at the beginning of their careers, it is equally applicable to all ranks of the Royal Air Force, and His Majesty's words will be remembered by all in years to come. It is likely that two further King's Colours will be presented later, one to Halton and another—a general Colour—for the Royal Air Force as a whole.

DANGER OF WEAKNESS

Marshal of the Royal Air Force Lord Tedder has made it abundantly clear that the inadequate flow of the right type of recruit, that is, those with sufficient technical knowledge, to take the place of skilled airmen being demobilized, and the inadequate time available to train unskilled men, has already brought about a serious situation. The Government recruiting plan is not providing the R.A.F. with airmen who have the technical skill and experience necessary for maintaining and operating modern air defence. It is a well-known fact that it takes several years to train men up to the very high standard of technical efficiency necessary to maintain modern aircraft. Conscription for so short a period is clearly not the answer for a Service equipped with material scientifically, and in its operational performance, far ahead of the most advanced material in use for civil purposes. In world affairs power politics are still a very real part of the international code and weakness arouses contempt and invites aggression.

The serious situation in the world today makes the efficiency of our air forces a matter of primary importance.

The new plan for increasing the strength and efficiency of our air crews is a step in the right direction, but it is a matter of the greatest urgency to provide and maintain an adequate number of highly trained ground crews. Whether or not the world situation demands the transfer of skilled men from industry to the Royal Air Force and their replacement by women, as was done in war time, we hope is a matter receiving the immediate consideration of our Government.

THE END OF THE AIRSHIP ERA

The airship era of the air age loses its last link in the dismantling of the last giant airship hangar at Pelham Air Station, Norfolk. It was built during the 1914-18 war, when a 50-lb. bomb was a heavy attack and Zeppelins floated over London.

The R33, pride of her day in the early twenties, was once housed there, as was the R34 which did a double crossing of the Atlantic in 1919, taking 108 hours going and 57 hours to return, her cruising speed being 45 m.p.h. Airships now go to join Daedalus.

THE JET-AIRCRAFT ERA

In comparison with the item of interest above it might be appropriate to mention the recent crossing of the Atlantic by a formation of six De Havilland Vampire jet fighter aircraft and the sixteen Lockheed F80 jet fighters of the American Air Force, who shortly after the arrival of the British aircraft in America flew the Atlantic and arrived in Germany, their total flying time being 12 hours 30 minutes. These successful transatlantic flights by British and American jet fighters will have a permanent significance in aviation history. In addition to their value as a military achievement, the flights may be regarded as a first practical sign that jet air transport over the world's trunk routes is approaching realization. Before long a commonplace expression will be: "Let's take a jaunt around the world in a jet."

THE WORLD'S LARGEST LANDPLANE

We await with some interest the maiden flight of the eight-engined Brabazon I, now nearing completion at Filton, Bristol. This 125-ton giant is expected to make its first flight in November.

AMERICA LOOKS AHEAD

"United States scientists are working on a guided missile capable of carrying an atomic warhead 5,000 miles," stated General Carl Spaatz in

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his final report as Chief of the U.S. Air Force. "Since there is no existing defence against this kind of weapon," he said, "it is essential that the United States should be the first nation to develop it."

Another opinion on the future is that of America's best-known military commentator, Mr. Hanson W. Baldwin (author of "The Price of Power"). The atomic bomb, in his opinion, is a finite and not an "absolute" weapon. The present bomb's destructive effect equals about 2,700 tons of T.N.T. For many years to come stock piles of atomic bombs are likely to be very small indeed, even in the U.S.A. Finally, the bomb is too bulky for sabotage purposes. Other war weapons of the future are atomic dust, new gases, biological agents and long-range guided missiles. All of these, however, still have to be developed considerably before they can become war-winners.

WORLD'S LARGEST AIRCRAFT EXHIBITION

The Society of British Aircraft Constructors staged the world's greatest show of aircraft, components and accessories at Farnborough airfield from 7th to 12th September. The exhibits were 100 per cent. British and among the thousands of visitors were representatives from nearly forty foreign countries, many of whom had contributed to the British aircraft industry's 1947 export total of £23¾ millions. In the aircraft park on exhibition were seventy different types of civil and military aircraft, of which sixteen were powered by jet or prop-jet engines. Those on show included flying-wings, helicopters, air liners, flying-boats, amphibians, trainers and private aeroplanes. Particular interest was taken in a futuristic family aircraft, the 200-m.p.h., four-seater Planet-Satellite, with a small 250-m.p.h. engine completely "buried" in the fuselage behind the passengers, driving an airscrew behind a "butterfly" tail, the wings and fuselage being of magnesium alloy construction.

Another interesting aircraft was a Lancastrian fitted with two inboard Rolls-Royce Merlin piston engines and two outboard Rolls-Royce Avon jet engines. Details of the latter engines, which are more powerful than the Nene or Derwent, are still secret. A new British air liner was the Handley-Page Hermes IV, which has a pay load of 14,640 lb., including forty passengers, over 2,000 miles. Its cruising speed is 213 to 276 m.p.h.

In the afternoon fifty of the aircraft put up a spectacular three-hour flying display. Pilots taking part were in two classes. There were those who wished to show the aerobatic qualities and speed of their aircraft; others flying small army co-operation, communication or private aeroplanes, wanted to demonstrate how slow and safe they were. Included in the demonstration were two flying-wings, the De Havilland Vampire with a Ghost jet engine, which gained the world height record of 59,492 feet, and several 600-m.p.h. fighters. One's neck muscles were hardly active enough to follow the swift downward approach, the "flash" past and the rapid disappearance of aircraft into the distance. It was quite amusing to watch the thousands of heads of spectators move, like a mass of troops on parade on the command "Eyes right," or the onlookers at Wimbledon following a terrific drive by a champion.

In the great hangars were two hundred stands displaying every kind of this country's products connected with aircraft, from the world's most powerful jet aircraft engine to the smallest screws of a well-known British firm. Six days seemed insufficient to inspect thoroughly the thousands of interesting exhibits or meet the host of old Air Force friends who congregated at this exhibition. This impressive shop window of the Society of British Aircraft Constructors Ltd. held about £4,000,000 worth of aeronautical goods. Private enterprise had something to be justly proud of, and when congratulating them Mr. Strauss, the Minister of Supply, said exports had risen from £5½ million in 1938 to £16 million in the first seven months of 1948. Although this was a civilian exhibition laid on for trade purposes, it was obvious, from the large number of past and present members of all ranks who attended, that personnel of the R.A.F. and Empire Air Forces were keenly interested. Some of them no doubt speculated as to which of the many aircraft they might themselves have the opportunity of flying at a later date.

SEVEREST ENGINE TEST ON RECORD

A standard De Havilland Mark II jet engine came through successfully the severest test yet attempted by any piston or gas-turbine engine. It was given 234 test runs of sixty-five minutes' duration each, with ten-minute intervals, every run simulating the full procedure of a combat flight to intercept enemy bombers. Through these weeks of relentless repetition the Goblin jet engine had 1,404 accelerations from 3,000 r.p.m. to 7,000 r.p.m. and 468 periods of running at maximum speed and output (10,000 r.p.m. and 3,130 lb. static thrust). Half of these were of one and a half minutes' duration and the other half extended to five minutes—a total of almost six hours of this harsh treatment. Besides this there

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was no less than twenty-five and a half hours in the rigorous condition of the interception climb at the maximum power allowed, which is 9,700 r.p.m. and 2,600 lb. static thrust. The 136 hours of cruising were not allowed to be at the low output of patrol, but at the maximum cruising power.

No aero engine has ever been called upon by the authorities to face a test so arduous as this, so strictly simulating the worst imaginable conditions of Fighter Command at war. This engine ran at its maximum take-off and combat power for six and a half minutes in every sixty-five-minute run, and at the end of the 234 "flights," without any maintenance or attention whatsoever, its performance at the end was precisely the same as when it began. This type of engine was fitted to the six jet aircraft (Vampires) which recently flew in formation across the Atlantic.

SPEED OF SOUND EXCEEDED BY JET AIRCRAFT

On 6th September, 1948, a De Havilland DH108 jet-propelled research aeroplane was put into a dive at about 40,000 feet and before the pilot levelled off at 25,000 feet he had attained a true air speed approaching 700 m.p.h. The pilot reported no unusual physical sensation, he suffered no "black-out," and was able to note the maximum reading of the Machmeter. It is necessary to make these high-speed tests in diving attitudes because the small De Havilland Goblin jet engine is not sufficiently powerful to achieve such speeds in level flight.

It is of interest to note that at the time of going to press (20th September) a United States Army Air Force pilot, Major Richard Johnson, claims to have set up a new world's speed record for jet aircraft by flying a North American F86 four times over a prescribed course at an average of 670.981 m.p.h. Major Johnson said that his aircraft, which carried the normal armament and ammunition, at no time approached its maximum capabilities.

R.A.F. MOUNTED POLICE AND POLICE DOGS

It is noted that the only R.A.F. mounted police unit in Europe has now moved from Celle, Hanover, to Hamburg, where it is being used for crowd and traffic control work as well as for patrols. That this useful unit numbers two only is disappointing.

The first R.A.F. mounted police force was formed in Iraq (Hinaidi) in 1925 and in view of the experience gained there, in its economy in police personnel and increased efficiency in patrol work, it is surprising that there are not greater numbers of these mounted R.A.F. police at home and abroad.

As one of the major tasks of the R.A.F.S.P. is the prevention of theft from airfields by intruders, one of the most practical steps taken to overcome the man-power shortage while still increasing efficiency was the introduction of police dogs. One dog on a lonely dispersed airfield is worth a dozen men, so every R.A.F. policeman (or policewoman) is taught dog-handling. These dogs—all Alsatians—are bred and trained by the R.A.F. at Staverton, near Gloucester.

THE EIGHTH ANNIVERSARY OF THE BATTLE OF BRITAIN

This last item of interest for the October number is written on Sunday, 19th September, 1948, at a time when, in many parts of the world, tribute is being paid to "those few" to whom "so many" owe an eternal debt of gratitude for their wonderful achievements in the Battle of Britain eight years ago.

Victory was not obtained without heavy sacrifice, and first we think of those who laid down their lives that their people might still enjoy a free way of life and that the principles of democracy might not perish.

Despite physical weariness from so arduous a fight, their enthusiasm for their cause shone brightly to the end. They went to their long rest their task accomplished, leaving behind a tradition that will never fade. Should the need arise may we acquit ourselves as magnificently must be the purpose in life of every member of the Royal Air Force.

"So be my passing,
My task accomplished and the long day done,
My wages taken, and in my heart
Some late lark singing,
Let me be gathered to the quiet west,
The sundown splendid and serene,
Death!"

Veterans of the Battle of Britain are still with us and we also remember on this anniversary the debt of gratitude we owe to them for their endurance and skill which finally defeated the numerically superior forces of Totalitarianism and Fascism. Their deeds of bravery will live as long as the story of man's endeavour is told. Their spirit will animate the great tradition of human courage; it belongs now, and will always belong, to the Royal Air Force; theirs is the privilege of having fought—and won—to save freedom for Britain and for the world.

"They met with Death
And nonchalantly passed the time of day;
'Immortals these,' he said beneath his breath,
And put his scythe away."

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Concerning Personnel . . .

AIR CHIEF MARSHAL SIR JOHN C. SLESSOR, G.C.B., D.S.O., M.C., Commandant of the Imperial Defence College, has been appointed Principal Air Aide-de-Camp to the King in succession to Air Chief Marshal Sir Roderic M. Hill, K.C.B., M.C., A.F.C., on his retirement.

The King has appointed Air Chief Marshal Sir Charles A. H. Longcroft, K.C.B., C.M.G., D.S.O., A.F.C., Gentleman Usher of the Scarlet Rod of the Most Honourable Order of the Bath, to be Registrar and Secretary of the Most Honourable Order, in the room of Admiral Richard G. A. W. Stapleton-Cotton, C.B., O.B.E., retired.

Air Vice-Marshal P. C. Livingston, C.B., C.B.E., A.F.C., Director-General of Royal Air Force Medical Services since March, who was appointed Honorary Surgeon to the King in May, 1948, has been granted the acting rank of Air Marshal.

The following have been appointed to fill the increased establishments of Honorary Physicians, Honorary Surgeons and Honorary Dental Surgeons to the King:

Acting Group Captain C. A. Rumball, O.B.E., to be Honorary Physician; Air Commodore E. D. D. Dickson, C.B.E., to be Honorary Surgeon; Group Captain M. J. Pigott and Group Captain R. G. J. Charlesworth to be Honorary Dental Surgeons.

Squadron Leader P. L. Arnott has been appointed Extra Equerry to Princess Elizabeth and the Duke of Edinburgh.

APPOINTMENTS

AIR COUNCIL.—Air Marshal Sir George Clarke Pirie has taken up his appointment as Member for Supply and Organization on the Air Council, in place of Air Marshal Sir Leslie N. Hollinghurst, who is now Inspector-General of the Royal Air Force.

AIR MINISTRY.—Acting Air Vice-Marshal Dermot Alexander Boyle, C.B., C.B.E., A.F.C., has taken up his appointment as Director-General of Personnel (1) at the Air Ministry.

COASTAL COMMAND.—Air Vice-Marshal John W. Baker, C.B., M.C., D.F.C., has been appointed Air Officer Commanding-in-Chief, Coastal Command.

TECHNICAL TRAINING COMMAND.—Acting Air Marshal J. Whitworth Jones, C.B., C.B.E., has taken up his appointment as Air Officer Commanding-in-Chief, Technical Training Command.

FLYING TRAINING COMMAND.—Air Commodore W. J. G. Walker, C.B.E., until recently P.M.O., Fighter Command, and formerly for nearly two years Deputy Director-General of R.A.F.M.S., has taken up the appointment of P.M.O., Flying Training Command.

TRANSPORT COMMAND.—Air Commodore Paul Sandland Blockey, C.B.E., who commanded the R.A.F. Station, Cosford, from September, 1946, has taken up his appointment as Senior Technical Staff Officer, Transport Command.

R.A.F., MEDITERRANEAN AND MIDDLE EAST COMMAND.—Air Commodore C. H. Flinn, C.B.E., former A.O.C. 85 Wing, British Air Forces of Occupation (Germany), has taken up his appointment as Senior Air Staff Officer, 205 Group, R.A.F., Mediterranean and Middle East Command.

SOUTH AFRICA.—Air Commodore G. S. Shaw, formerly A.O.C. Air Headquarters, Burma, has taken up his appointment as Senior Liaison Officer with the United Kingdom Service Liaison Staff, South Africa.

INDIA.—Air Marshal Sir Thomas W. Elmhirst, K.B.E., C.B., A.F.C., who has been Air Officer Commanding Royal Indian Air Force since August, 1947, has assumed the title of Chief of Air Staff and Commander-in-Chief, Royal Indian Air Force, in accordance with a decree of the Government of India that this should be the title of the senior officer of the Royal Indian Air Force.

R.A.F. OFFICERS FOR IMPERIAL DEFENCE COLLEGE

The following R.A.F. officers have been selected for the fourth post-war course at the Imperial Defence College, which lasts from January until December, 1949:

Air Commodore Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., Air Officer Commanding No. 61 (Eastern Reserve) Group.

Air Commodore The Earl of Bandon, C.B., D.S.O., Commandant, Royal Observer Corps.

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Air Commodore F. J. Fressanges, C.B., Director of Operations, Air Ministry.

Air Commodore T. G. Pike, C.B., C.B.E., D.F.C., Director of Operational Requirements (A.), Air Ministry.

Air Commodore H. D. Spreckley, O.B.E., Commandant, Empire Air Armament School.

Group Captain (Acting Air Commodore) A. W. B. McDonald, A.F.C., Commandant, R.A.F. Staff College.

Group Captain G. P. Chamberlain, C.B., O.B.E., Director of Civil Air Operations.

Group Captain E. N. Lowe, C.B., O.B.E., Officer Commanding No. 16 Maintenance Unit.

RETIREMENTS

Air Chief Marshal Sir Roderic M. Hill, K.C.B., M.C., A.F.C.

Air Marshal Sir H. E. Philip Wigglesworth, K.B.E., C.B., D.S.C.

Air Marshal Sir Andrew Grant, K.B.E., C.B.

Air Vice-Marshal R. Graham, C.B., C.B.E., D.S.O., D.S.C., D.F.C.

Air Vice-Marshal E. S. Goodwin, C.B., C.B.E., A.F.C.

Air Vice-Marshal S. E. Toomer, C.B., C.B.E., D.F.C.

Air Vice-Marshal J. A. Boret, C.B.E., M.C.

Air Commodore H. J. Collins, C.B.E.

BOOK REVIEWS

An Airman reviews Major-General Fuller's Book "The Second World War"

THIS is a book which I think all airmen will be interested to read. My remarks in this review are addressed to airmen, and I propose to deal mainly with the author's treatment of air power in his ambitious work. In fact, I do not intend to make any cantankerous sorties into problems which concern purely Army techniques of war.

The Meaning of Air Power

General Fuller does less than justice to himself in his appreciation of air power. Pages 216 to 219 in particular, and many other statements in general, embrace his idea of air power. It consists, according to him, of that type of air superiority acquired by escorting, covering, providing an air canopy and so forth—a rather tactical and superficial notion of all that is involved in achieving air superiority (see Lord Tedder's Lees Knowles Lectures). Further, it consists of ground attack aircraft and mainly logistic support in the form of an airborne line of communication for the army. He says: "The primary purpose of aircraft in war lies in the logistical and not in the tactical sphere."

All this is the child of misconceptions dating from a pre-1939 period. He sees only the tactical role of the air arm. This, of course, is but a small portion of the work of air forces, as may be shown from the following *ad hoc* list of examples of the air tasks which must be undertaken in the wider sphere of our war effort:

Task	*Air Forces Involved*
(*a*) Air defence.	Fighter and mainly bomber.
(*b*) Air superiority.	Bomber against industry, airfields and installations; fighter as tactical touching up.
(*c*) Anti-submarine war.	Bomber against ports; also mining; tactical reconnaissance and attack at sea.
(*d*) Security against invasion.	Bomber against ports, airfields, etc.
(*e*) Maintenance of sea power.	Bomber against fleet units, ports, convoys, etc. (Midway).
(*f*) Offensive action when denied access to continent.	Strategic air offensive against source of war potential.
(*g*) Air superiority in overseas theatre to cover amphibious and land operations.	Bomber and fighter types.
(*h*) Air support.	Fighter, medium bomber, etc.
(*j*) Transport support.	Transport.

Decision on Land

General Fuller says: ". . . in spite of aircraft, decision is still gained on the surface of the earth." Trafalgar had to be fought before Waterloo could be won. The Battle of Britain had to be fought before Britain was secure, and before further moves on the surface could be made. What the author is talking about is an "eventual decision." What was achieved in 1945 was an eventual decision after a closely co-ordinated pattern of effort by sea, land and air forces for many years. His notion of what is decisive in a particular battle is not applicable to a war as a whole where decision may very well be achieved in culmination of a far-reaching strategy, with emphasis, no doubt, on one or other medium or technique of war. Without the strategic air attack oil would not have immobilized the German armies and air force after

THE SECOND WORLD WAR, 1939-1945. By MAJOR-GENERAL J. F. C. FULLER, C.B., C.B.E., D.S.O. (Eyre & Spottiswoode; 21s. net.)

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D Day. But no single weapon or service can be isolated as the decisive means to victory. The decision is reached by the compound effort of all weapons, and it is idle to try to fit all these on to an historic battlefield—"the same old board"—or into a strategy as clear cut as the two-dimensional Cannæ or Arbela clashes.

Strategic Bombing

On pages 220 to 231 and 313 to 317 General Fuller flays the conception of strategic bombing. In war, especially in these days of atomic weapons, officers of all services should see our strategy as a single and undivided entity. It is clear that the source of all the enemy's war activities lies in his industrial war potential. In fact, the common denominator of air, land and sea warfare lies here in the very crucible of his fighting strength and endurance. Air attack against this potential constitutes a direct attack, while at the same time our use of the sea, guaranteed today more than ever by air power, enables us to develop our peripheral operations in an indirect approach. It is between the millstones of the direct and indirect action that we may seek to grind the enemy. This is the proper conception of the complex wars of today. All services have their part to play in this joint war strategy—and no service can operate without the continuous active assistance in one degree or another of the other two.

On page 230 General Fuller inaccurately states that 40 to 50 per cent. of our war potential was devoted to the aircraft industry. Only 7 per cent. of our war effort was devoted to the strategic bomber offensive (see Lord Tedder's Lees Knowles Lectures and Air Marshal Sir Norman Bottomley's lecture "The Strategic Bomber Offensive against Germany," *R.U.S.I. Journal*, May, 1948). One rather wonders what might have been the verdict if some portion of the other 93 per cent. of our war effort had been brought to the support of the bomber offensive!

General Fuller fails to realize the problems of achieving accuracy and therefore does not see how the air forces would have wished to single out a particular industrial target system had this in all the tactical and technical circumstances been practicable at all times. The policy of area bombing of cities was, of course, governed by a compromise between what *could* be done and what *it was desired* to do.

Air Power in a Land Offensive

General Fuller regards this as the be-all and end-all of air power. It is, of course, only one of the large number of tasks which itself is contingent upon the success of others—namely, the achievement of air superiority, the opening of the sea routes, etc. A more lucid and impressive account of air power in a land offensive is given by Air Marshal Sir John Slessor in his article "The Effect of Air Power in a Land Offensive" (*R.U.S.I. Journal*, May, 1948).

Broadly the author's conception of the role of tactical air forces is agreed. Certainly it is not the wish of the R.A.F. to bring the strategic bombers on to the battlefield unless they can be of decisive assistance. Except at the final battle perhaps, there is the continuing campaign of weakening the enemy, keeping his air and sea power under control and preparing the way for further surface operations—all of which make heavy and unrelenting demands upon the strategic air forces—to say nothing of their main role of disembowelling the enemy's war potential.

The author's ideas on page 231 might have been put forward seriously before the last war, but no thinking officer of the Navy, Army or Air Force would hold such elementary and narrow views today. They spring from the apparent inability of the author to understand the influence of air power, and the fact that in its train all strategy has been welded into a single and indivisible unity.

Was the R.A.F. Non-Co-operative?

To state, as on page 165, that the Air Force was non-co-operative is a misrepresentation. The R.A.F. was concerned to keep its fighter and bomber forces intact to ensure that a favourable air situation was maintained. They could not be frittered away in ground attacks which caused a heavy drain in minor and major unserviceability, quite apart from actual losses. Every aircraft had to come via Takoradi—Khartoum—Egypt . . . and they were none too plentiful. Moreover, in developing air support in land warfare, the R.A.F. led all the way in suggesting and devising the means:

(*a*) It experimented with and developed the fighter-bomber technique.

(*b*) In the Middle East the air support organization was tried out in Syria, and developed continuously from the 1941-42 campaigns in the desert onwards.

(*c*) Reconnaissance needs were rationalized and efficiency much increased.

(*d*) Where feasible within all tactical limitations, the heavies were used on the battlefield.

(*e*) Air Headquarters was placed alongside G.H.Q. as a result of insistence by Air as much as by Army staffs and commands.

(*f*) Lack of intimate planning between Air and Army staffs was certainly no more

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an Air than an Army failing, and this was soon put right.

Etc., etc.

CONCLUSION

General Fuller is steeped in "military" precepts of strategy and lore of ancient times. As a result he attempts to squeeze the new techniques of war into the historical framework laid for him by the techniques and problems of land warfare. He sees only a segment of the whole, and does not appear to appreciate the developments which have occurred. He takes the mole's-eye view, and would shackle new potentialities to an old-style war.

His views on strategic bombing on the battle-field provide food for thought in places. But on the whole his views on the use of aircraft in the strategic role are ill-informed and reveal a deeper misconception of war strategy today. No amount of journalistic ranting and chronic prejudice will benefit readers who are in search of fact and a proper focusing of war. This smirch on his work inevitably invokes the intelligent man's distaste for rather unwise and acrimonious bias.

His book should be read by airmen with a critical eye. So long as the persistent bias of yesterday is overlooked there is much of interest. His arguments will serve to convince the United States how right they were to create a separate air force, and they will certainly not impair the good order of our Service organization in this country.

"AQUILA."

LABORATORY OF THE AIR. By JOHN PUDNEY. (H.M.S.O.; 3s. 6d.)

This book gives an interesting account of the Royal Aircraft Establishment, Farnborough, and is also of necessity an outline of the development of—and of Government participation in—aeronautical science in Britain. It tells of early experiments with military balloons at Aldershot, Woolwich and Chatham; of the first British use of balloons in warfare; of early attempts to fly in man-lifting kites and non-rigid and semi-rigid airships; and of the infancy and growth of the power of the aeroplane.

This history of the cradle of military flying should be of considerable interest to members of the Royal Air Force.

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That very old problem of "Do Boffins fly?" is solved once and for all time by this interesting book. Many Farnborough theorists have become pilots as familiar with conditions in the air as they are with their own benches or laboratories. This community of specialists have only rarely been called upon to design a complete aeroplane; they have acted rather as consultants, and since 1916 their activities as designers have been restricted to directions largely unexplored by the aircraft industry. That in 1929 British aeronautical engineers and scientists designed and built a "flying bomb" is revealed in this book. The Larynx, or pilotless monoplane, partly controlled by radio, designed to carry about 250 lb. of explosive at 100 to 150 m.p.h., was tested over the deserts of Iraq, and flew for hundreds of miles during these tests, before the whole affair was officially abandoned.

Much of their work has gained wide distinction, much has, of course, been shrouded in secrecy, and the emphasis has always been on team achievement. The staff seems to be something of a family affair. Some of these men, engaged as boys in making the parts for Queen Victoria's balloons, have lived to make the parts for the special bomb sights used in the aircraft which destroyed the Möhne Dam. Many of them have sons, and even grandsons, who have followed them to Farnborough as apprentices.

Selected examples of this establishment's outstanding successes are mentioned, in addition to scientific knowledge and its application to problems connected with flight. These include predictor gunsights, navigation instruments, air photography, gas-turbine engines in aircraft, the V.H.F. (Very High Frequency) system of radio communication, the catapulting and deck landing of carrier-borne aircraft, and special questions of stability and stress confronting the aerodynamics department.

The book and its numerous illustrations provides a valuable summary of the great record of the Royal Aircraft Establishment and those connected with it since the days of Colonel J. L. B. Templer (1878-1906), S. F. Cody (1906-1909) and Geoffrey De Havilland (1910-1914) up to the present day.

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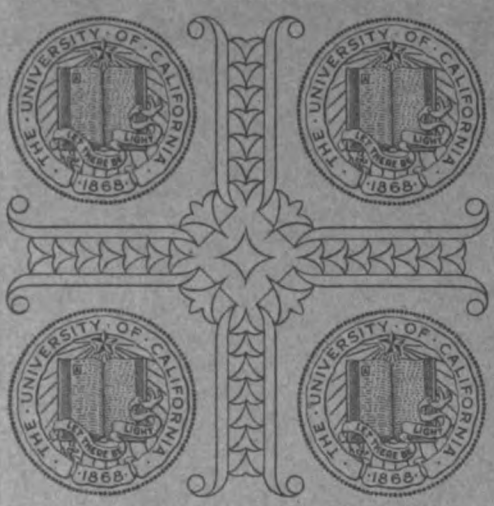
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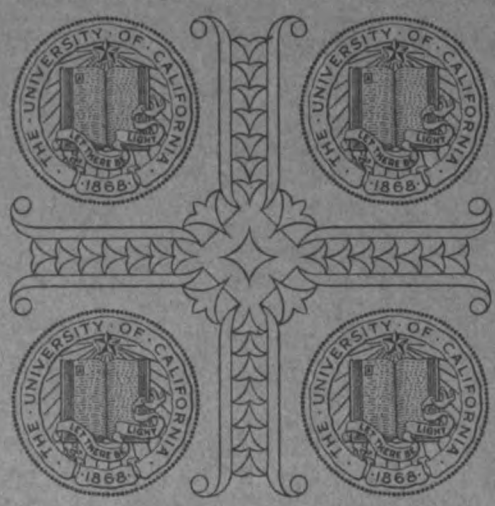
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